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Hitachi's newly-launched 'Peach' is one of the highlights of this month's news. See page 6.



We get right into kit computing with a general rundown, plus three tests. It starts on page 19.



An experienced user reports on the Texas Instruments TI99/4. Page 70.



Computerisation comes to the world's biggest toy factory. For our exclusive report see page 34.

editorial



RECENTLY, when working on a well-known Japanese small business system for an associate, it became necessary to use a short assembly language program to drive some I/O circuitry. Although the machine is sold with the CP/M operating system as standard, a search through the disks supplied with the system revealed no copy of ASM, the CP/M assembler. Similarly, DDT was found to be missing, as was SUBMIT, XSUB and other CP/M utilities which I would normally consider essential.

Enquiries with the company failed to establish whether or not the missing software was normally supplied. It seems, on further enquiry in the industry, several computer companies in the small business machines market feel the provision of an assembler would encourage the user to interfere with the system, and so they remove the temptation.

Rubbish. If a system is advertised and sold as using the CP/M operating system, then it should be supplied with all the utilities normally supplied as part of CP/M — including a copy of the BIOS source code. After all, the user has paid for it — assuming that the licence fee went back to Digital Research, that is.

It is arrogant in the extreme for the computer companies to restrict their customers' use of the machines they have bought, particularly by withholding goods which the customer has purchased and paid for. If your supplier does this to you, stand for your rights — you're being cheated.

Among other news to emerge last month was the Communications Minister's decision to block Telecom from offering Prestel service to the public. The implications of this decision are far-reaching. The immediate result is that Prestel service is not likely to be offered to the Australian public at a reasonable cost for some years now. Instead, private enterprise will be encouraged to provide services and it seems likely these will be aimed at business users initially, at a higher price.

More importantly, the private concerns will probably be forced to operate under the constraints of legislation where Telecom, as a government instrument, would have had considerably more freedom from scrutiny. In short, if you're waiting for Prestel, don't hold your breath — it's in a worse mess than ever before. □

Les Bell

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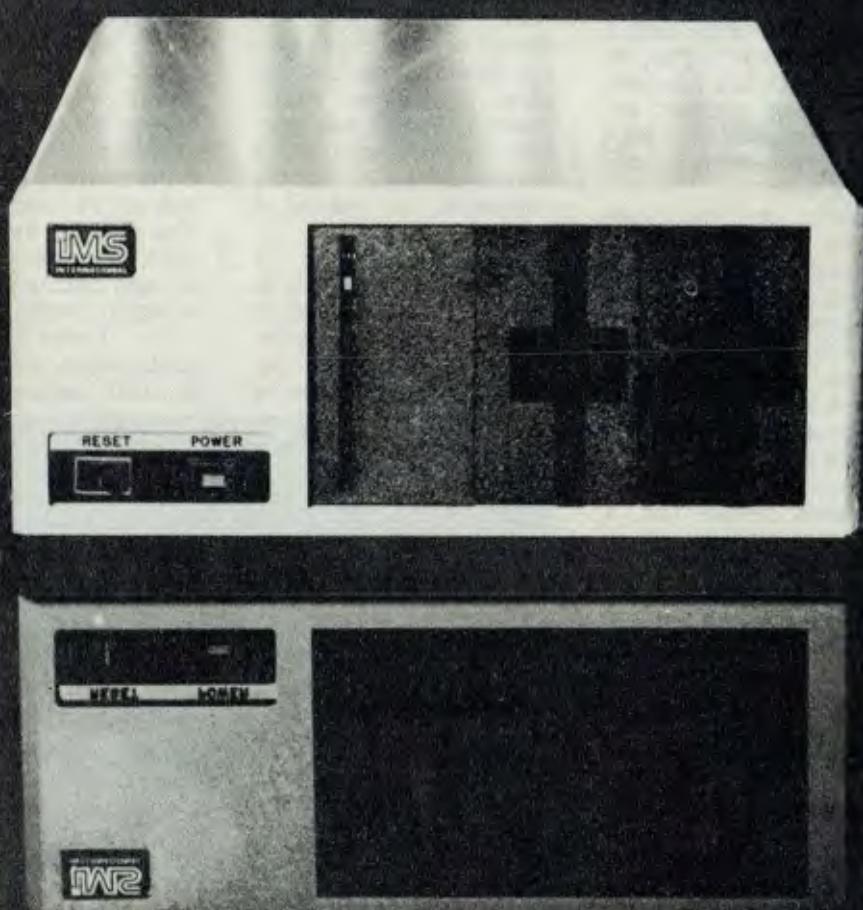
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If you know our Series 5000 table top computer line, you know that *good* things come in small packages.

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your computer news



Delta plans a market assault with Hitachi's MB-6890, or Peach.

Delta's Peach Deal

DELTA Semiconductor Peripherals of Melbourne has embarked on a major distribution programme for the Hitachi MB-6890 — better known as the Peach.

Delta, the firm left on the outer by Apple's recent restructuring of its Australian distribution arrangements, aims to flood the market with the Peach, according to a director, Mr John Miller.

Mr Miller told *Your Computer* that Delta was currently importing 200 units per month. But Hitachi was investing strongly locally, looking to gain a large market share in a short time.

"We plan to bite the bullet on costs, perfect the English language software, and move into the bigger United States market in six months time," he said.

Mr Miller said Hitachi (the firm which builds the famed 'bullet' trains) is the third largest corporation in Japan. It builds dozens of computer models, including the AS-9000, which is claimed to be the world's most sophisticated computer.

"We are being quite selective in choosing dealers," Mr Miller continued. "We will insist they carry major parts at board level, on site. While we don't anticipate any prob-

lems, we want to provide that standard of service."

Commenting on Apple's decision to 'terminate' Delta's major distributor rights, Mr Miller said Delta's principals had been left surprised, unhappy and bitter. He said it hurt them to hurt a number of good dealers.

Turning to the new machine, the Peach is HD-6809 based, with Microsoft's Level 3 Colour BASIC (24K bytes) and 32K of RAM.

It includes many built-in features, which will save the owner from buying expensive options at a later date. These features include an RS-232C communications port and a Centronics parallel port, a light pen interface and a cassette interface.

The basic unit allows the choice of 40 columns by 25 lines, or 80 columns by 25 lines under software control. The Peach is capable of producing superb high resolution graphics (640 x 200 pixels) in eight colours.

The 87-key keyboard has a full numeric keypad and 10 user programmable function keys (five, with shift). The machine also allows the use of the full screen editor or Microsoft's local line editor to edit programs. It will address a full megabyte.

The Peach has a real time clock, RF shielding, six inter-

nal expansion slots, and another two slots for taking additional memory cards.

Options include 13cm disk drives, 7.5cm Winchester hard disk units, an RGB colour monitor, and an inexpensive dot matrix printer. Delta also has word processor software which the firm believes is the world's best.

"What is very good for local buyers is that the 6890 is being sold for a lower price than it is in Japan. And it is sold there as the most powerful personal/small computer available," Mr Miller said. □

Graphics System

THE MIRROR 2000 is a new graphics oriented personal computer with a retail price under \$400 assembled (but without case or power supply). Based on the 6502 processor, it features an 8K graphics BASIC with cassette save and load, and a number of special graphics commands, as well as a machine code monitor.

Graphics resolution is 256x128, programmable to 256x256, and a colour board has been successfully prototyped. In text mode, the screen offers 16 lines of 44

columns as standard, programmable to 32 lines with 5x7 dot matrix characters.

The character generator is programmable in content, size and format, and the character set can vary from 16 to 256 characters.

The programmable video RAM can reside anywhere in memory, presumably using a DMA access technique (like the Super 80), making animation an interesting possibility. The keyboard has 56 keys, plus two keys available to the user.

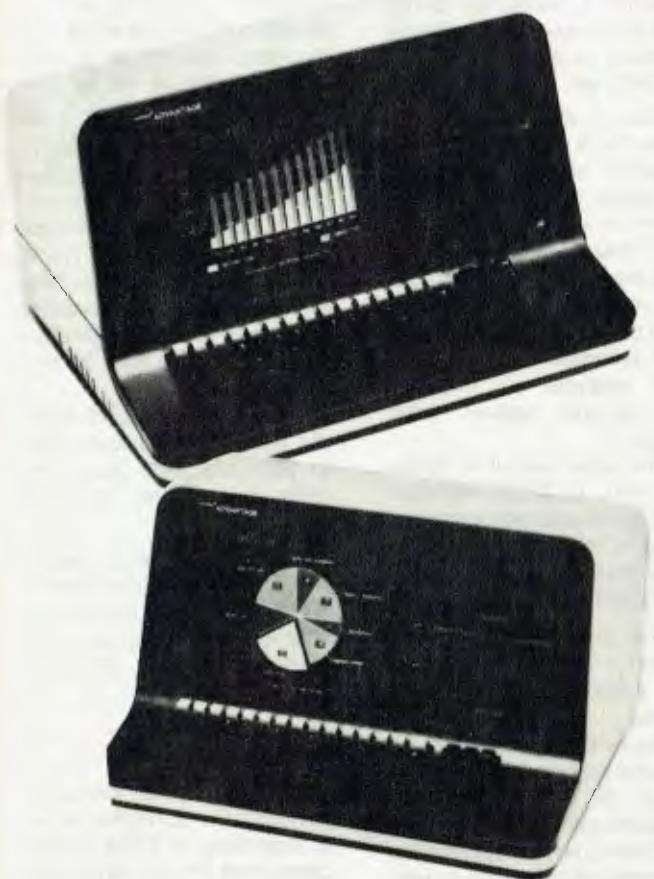
A sound port on the board uses a programmable shift register and free running oscillator to generate tones, and there is an RS-232C output, allowing printers and other peripherals to be attached.

A 40-pin expansion bus allows the connection of an optional expansion board, and 8K of memory and a colour output are also available. This provides three bits per pixel, giving the user a choice of eight colours from a total selection of 4096.

For further information contact Mirror Systems at PO Box 922, Geelong 3220. □



A graphics-oriented computer for under \$400 — the Mirror 2000.



NorthStar

AS ALLUDED to by CP/M columnist Bill Bolton last month, the new NorthStar computer has been released here by Anderson Digital Equipment. The new machine, called Advantage, is specifically designed for graphics applications.

Based on a Z-80 processor, it uses a new disk operating system which provides support for the bit-mapped graphics screen, as well as a superset of BASIC called GBASIC. For those who prefer it, there is also a graphic-enhanced version of CP/M. Both operating systems offer a graphics mode which provides two sets of functions: four geometric functions, POLYGON, RECTANGLE, ELLIPSE and SPECIAL LINE, and three graphic support functions, CLEAR, BLOCK, and CHAR.

For commercial applica-

tions, NorthStar's Application Support Program provides access to a wide range of accounting, word processing and database management programs. Interestingly, each of the applications packages is written in a derivative of the C language, which is also available.

The system includes 64K of main RAM, plus 20K in the display and a 2K boot ROM, two quad density (360K/diskette) drives, and an 87-key keyboard. The screen is 80 x 24, with a graphics resolution of 640 x 240. There are six slots (presumably S-100, but NorthStar seems embarrassed to admit) for expansion.

The system will sell for under \$5000. For further information, contact Anderson Digital equipment in State capitals, or its head office at PO Box 422, Clayton, Vic 3168. Phone: (03) 544 3444. □

IBM 5150

THAT'S THE official name of what most people term 'Big Blue's peccy' (the IBM Personal Computer). The machine has been available for a couple of months now in the US; and although IBM Australia is saying nothing, there's been a queue of would-be distributors and retailers outside its office.

The PC is based on the Intel 8088 processor, and although this should give it a turn of speed, its BASIC is huge (over 200 functions compared to approx 130 in standard Microsoft BASIC) - and this slows it down to compare with average Z-80 systems.

An interesting feature is the empty socket beside the CPU chip and another in the row of ROMs. This will apparently accommodate the Intel 8087 floating point math chip, and both BASIC AND IBM's Pascal already have hooks built in to drive the chip. That should really speed things up again.

The video circuitry of the computer is on a separate card which plugs in; there is a choice between a monochrome monitor/printer adapter, and a high-res graphics/colour adapter. The colour adapter also provides support for a user-supplied light pen.

Built into the BASIC is a colour graphics macro language, with commands such as PAINT, DRAW, CIRCLE, COLOR, and so on.

To encourage outside vendors to supply hard/software, IBM has released a technical manual which gives full details of the internals of the machine. An advanced communications program should be available by now, with an IBM 3270 emulation program in the works.

The major problem voiced by owners so far is the low capacity of the disk drives. As one user on The Source remarked: "The IBM itself isn't bad at all, but the engineering that went into it makes the Taiwanese seem hi-tech. Considering the drives are Tandon's, and Vector milks 630K out of the ones it uses, one wonders what prompted 'Their Magnitude' to release such a travesty".

Other rumours and tips: the Mark Williams Company (remember XYBASIC, a process control BASIC) will have its UNIX-like operating system, Coherent, or at least the C compiler thereof, for the peccy. The compiler will use the two-segment model, allowing up to 64K for program, up to 64K for data, and is said to produce 15 percent tighter code than on a PDP-11. □



IBM's 5150 personal computer at work, in word processing guise.



Hewlett-Packard shirt-pocket sized programmable calculators.

New Slim-lines

TWO NEW programmable calculators from Hewlett-Packard, one scientific and one for financial and business problems, come in a slim-line design that fits into a shirt pocket.

The Hp-11C scientific calculator features powerful programming tools and a full set of scientific functions. The HP-12C financial calculator is claimed to have an unrivalled number of built-in keyboard functions for solving time and value for money problems.

Both feature liquid-crystal display, continuous memory, a horizontal keyboard design and many built-in keyboard functions and programming tools.

Recommended price for the HP11C is \$160 tax-free, and \$180.50 including tax. The HP-12C's recommended price is \$178.00 tax-free and \$201.00 tax included. □

Compu-cooks

COMPUTERS ARE playing a role in the age-old business of pastry making.

At International Pastries at Dee Why in Sydney, an Adler Alphatronic micro computer is used to sort and compile lists of orders from up to 200 shops and clubs.

By the time the seven staff cooks come on duty at midnight, they know exactly how many croissants, chocolate eclairs, lamingtons and other assorted pastries they need to make.

International Pastries' Managing Director, Mrs. Diana Williams, said there were numerous advantages in having the computer installed. She said wastage was reduced, because the problem of baking too much (or too little) was eliminated; there was no need to offer substitute stock and no need to apologise for short or non-deliveries. Costs were kept firmly in line and she always had a clear picture of the company's profitability.

Mrs Williams said the computer also took care of invoicing and other information for normal debtor's ledger, as well as accounting and sales statistic work. □

Digital Graphics

S.I. Microcomputer Products has announced its appointment as the Australian distributor for Digital Graphics Systems of Palo Alto, California.

Digital Graphics Systems produces a range of powerful, integrated, yet expandable

imaging systems for S-100 bus microprocessors. Image memory ranges from 32K to 256K bytes.

The models feature the video flash digitiser, or frame grabber, which captures live television images and stores them in digital form in the CAT image memory; and dual port image memory which can be accessed from the S-100 host processor for software image generation or software image analysis, or modification of the digitised video image.

The video output is optionally PAL or NTSC standard and generates high resolution images in black and white, grey levels, RGB colour and composite colour.

The palettes of colours used for display are defined by software in four high speed display mapping memories which assign specific colours to each of the 4, 16, 256, 4K or 64K possible pixel values. The contents of these colour maps can be changed dynamically to produce animation and other effects.

Formats, pixel resolutions and all other parameters are software selectable, giving typical resolutions of 484 × 512, 484 × 256, 242 × 512, and 242 × 256. In all 15 formats are selectable for digitisation, as well as for display, and offer resolutions ranging from 256 to 1280 pixels per television line.

The CATS are available in a range of six different models, with different options. Starting price for this equipment is \$3200. □

TRS-80 Schools

TANDY ELECTRONICS, retailer of the TRS-80, is helping Sydney's Macquarie University study the effects of computer education of 2000 children in New South Wales primary schools.

TRS-80 Model III micro-

computers are being used in ten schools, by Grade 5 and 6 students. The Model III was chosen because of its low price and versatility.

Macquarie University has a federal grant to investigate the use of computer aided instruction (CAI) and direct instruction (DI) techniques in NSW schools. CAI and DI, as they are known by educationalists, are two of the most powerful teaching methods known today.

The CAI programs will teach the participating children how to plan and write their own computer programs, using the BASIC language.

The schools began using the TRS-80 microcomputers in June 1981, and the first results from the experiment are expected to be tabulated early in 1982. □

CISA Courses

DUE TO popular demand, the CISA School of Business, a subsidiary of CISA Microcomputing Pty Ltd, is considering starting a series of evening tutorials/lectures/study groups specifically aimed at the small business microcomputer users. The objectives will be to give people a deeper understanding of the possibilities of BASIC, knowledge of file handling and manipulation, use of Lazywriter word processing packages and advanced operating systems.

Instruction will be for a minimum of two hours, twice weekly at \$25.00 per session. Stationery and light refreshments will be provided. Homework will be allocated if required and specialist/professional instruction will be available by appointment for an appropriate fee.

All sessions will be a small group instruction in the Sydney metropolitan area only. If you are interested, contact Eric Ackroyd on 29 1599 (business hours). □



Tandy Catalogue

THE AUSTRALIAN branch of the giant US-based Tandy Corporation, Tandy Electronics, has announced the release of its new 1982 catalogue, available at no charge from nearly 300 Tandy stores, computer centres and participating dealers throughout Australia.

The 158-page catalogue — with over 100 full colour

pages — is "brimming with the latest innovations in consumer electronics".

Tandy has packed nearly 2500 products and all of its famous brand names, such as Realistic, Radio Shack, TRS-80, Archer Micronta and Science Fair, into the catalogue. It contains microcomputers and accessories, stereo, auto sound equipment, calculators, clocks and radios, electronic games, kits and toys, intercoms, CB, PA and security systems, telecommunications products and television antennas — plus all of the tools, hardware, electronic parts and accessories.

Inside the catalogue's front cover is a comprehensive product index, store dealer address list, details on quantity prices, charts for adaptors, stylus and batteries and a mail order form.

TTL/CMOS Course

AN ECONOMICAL new 'hardware oriented' course in TTL and CMOS circuits is being offered by Heathkit/Zenith Educational Systems, distributed in Australia and NZ by Warburton Franki Ltd.

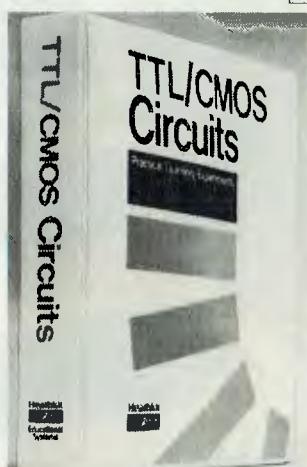
Designed for the electronics student, experimenter, radio amateur or computer enthusiast, the abbreviated, to-the-point circuit descriptions are ideal for the person who wants to learn by doing.

The TTL and CMOS circuits course is comprised of a series of circuit files, arranged in a logical progression. Each file provides the student with a description of the particular circuit and its operation, a circuit schematic, and modifications that can be performed on the basic circuit. Text reading is condensed and the course places emphasis on actual

circuit construction.

Sixty-five electronic components for constructing more than 50 circuits are included with the course.

For more details, see the latest 104-page Heathkit catalogue. For a free copy, write to your local Warburton Franki office.



NOW CP/M ON COMMODORE

WE PRESENT THE SOFTBOX

Simply by plugging the SOFTBOX into the Commodore IEEE Port and loading the CP/M disk, the Commodore will run under the World's most popular disk operating system - CP/M. No internal connections or modifications to the Commodore are required.

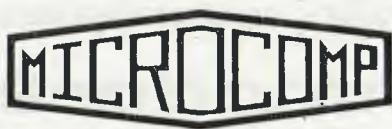
The SOFTBOX allows access to almost all microcomputer languages, including CIS COBAL, FORTRAN, CP/M, PASCAL, APL, PL/1, CORAL 66 and Extended Microsoft BASIC (both interpreter and compiler), as well as the vast number of commercial accounting suites currently available under CP/M. Business applications and word processing packages designed to work with specific terminals (e.g. Lear Seigler ADM3A, Televideo 9122 or Hazeltine 1500) will need no modifications to work with the Commodore screen as the SOFTBOX allows the Commodore screen to emulate any of these devices.

Specifications:-

- ** Full 60K byte RAM.
- ** CP/M Version 2.2.
- ** Z80 CPU running at 4Mhz with no wait states.
- ** Dimensions: 25cm x 9cm x 16cm.
- ** Operates with any series - 2000/3000/4000/8000 Commodore.
- ** Supports up to 8 Commodore Disk Drives in any mix of 3040/4040/8050 Drive tapes.
- ** Diskette containing CP/M system with utilities and full documentation included. Please specify which disk format (3040/4040/8050) when ordering.
- ** Optional RS232 Serial Interface (with user definable baud rates) for use with a terminal or printer.
- ** Optional Corvus Drive Interface.

When ordering your SOFTBOX and software, please ensure that you specify the correct model number of your Commodore CPU and Disk Drive. **PRICE: \$1290.00 (ex Tax).**

YC. 6



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COMPUTERS

PET 4016

FEATURES

The PET 4016 offers an IEEE parallel port and an IEEE-488 bus for disk and printer communications. Also included is an eight bit parallel user port with "handshake" lines. The PET supports two Commodore C2N cassette ports for external cassette input and output.

Each PET 4016 includes 18K of ROM containing BASIC and a machine-language monitor. The BASIC interpreter is activated when you turn on your PET 4016 - no loading is necessary.

12" SCREEN

40 characters wide by 25 lines long.
128 ASCII plus 128 graphic characters
8x8 dot matrix characters
Green phosphor screen.
Brightness control.

KEYBOARDS

74-key professional keyboard.
Separate calculator/numeric pad.
Upper-case alphabetic characters.
Shift key gives 64 graphic characters.

MEMORY

PET 4016: 16K (15359 net) random access memory (RAM).

POWER REQUIREMENTS

Volts: 240v
Cycles: 50HZ
Watts: 100

SCREEN EDITING CAPABILITIES

Full cursor control (up, down, left, right).
Character insert and delete
Reverse character field
Overstriking
Return key sends entire line to CPU regardless of position

INPUT/OUTPUT

Parallel port
IEEE-488 bus
2 cassette ports
Memory and I/O expansion connectors

FIRMWARE

18K of ROM contains:
BASIC (version 4.0) with 9-digit floating binary arithmetic
Tape and disk file handling
Machine language monitor

PHYSICAL SIZE

Height: 14"
Width: 16.5"
Depth: 18.5"
Shipping Weight: 46lbs

For details of your local dealer send to:

Commodore Information Centre, Box 336, Artarmon, New South Wales 2064. Australia. Telephone (02)437 6296



'Mainframe muscle' in a 76cm high cabinet, from Perkin-Elmer.

Little Big-timer

WITH THE release of its Model 3210 computer, Perkin-Elmer Data Systems has set out to scalp the opposition, both at the top end of the 16-bit market and the lower end of the mainframe segment.

Priced at under \$60,000, the 3210 is an entry-level version of the successful 32-bit Megamini. It stands less than half the height of a man and weighs under 220kg.

Warwick Purser, national marketing manager at Perkin-Elmer says: "The 3210 affords entry into the big time computer arena previously denied many businesses. Priced to compete with top of the range 16-bit computers, the 32-bit 3210 offers all the processing capabilities of the Megamini, which means it also competes with a number of mainframes at a

fraction of the cost."

An important release for medium sized businesses who see their own expansion just around the corner, the low price of the 3210 means they can skip the step of having to work their way up through less powerful 16-bit systems.

The 3210 has as much computer power as the largest 16-bit machines and being completely compatible with the rest of the Perkin-Elmer Megamini range, expansion is no problem.

Extremely compact, the 3210 is housed in a low profile 76cm cabinet with up to 4MB of main memory, up to 1000MB of disk storage, and able to support up to 32 users running a variety of large, complex application programs.

As with all Megamini models, the 3210 runs under Reliance II, an extremely power-



TELEREADER CWR-685

Communication Computer

- ★ Fully self-contained with built-in green screen, monitor and keyboard
- ★ Automatic (or manual) transmit/receive switching of transceiver
- ★ Fully portable - 12-14 V dc (1.5amp)
- ★ 323.w x 276.d x 127.h (mm) in size
- ★ Visual display in both transmit and receive
- ★ Optional printer (240 V ac) available
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ful transaction controller which allocates systems resources and controls terminals and supervises disk allocation and data access. It supports an interactive query language, RQL/32, which requires no programming skills and puts executives at the keyboard, allowing them to call up their own information from the data base.

The 3210 also supports Megamax, the Perkin-Elmer business software package developed in Australia for Australian businesses. Programming languages include COBOL, CAL MACRO, RPGII, and a new FORTRAN/Reliance interface of particular use to programmers seeking large number crunching capabilities. □

New Vector

DICKER Data Projects has introduced the newest member of Vector 3 family, the Vector 3032, to the local market.

The machine incorporates the high-speed 20cm (8 inch) Winchester disk drive. It offers the largest storage available on a Vector system, over 32 Megabytes formatted.

It therefore allows software to make full use of the maximum size files allowed by the CP/M 2 operating system — 8 Megabytes per file.

The 20cm Winchester drive selected for use by Vector has several characteristics which Vector expects to make it highly reliable: a low, 70-watt power rating, a single electronic PCB requiring no adjustments, and a fail-safe head loading and shipping zone.

Vector claims the 3032's performance is optimised with the inclusion of a Z80B microprocessor, 6MHz clock and high-speed 4K ROM standard in all systems.

This increase in processor speed, from 4MHz to 6MHz, will result in a significant increase in system performance, says Vector. □



With the 1010 system, Olivetti is challenging IBM and Wang in word processing.

Olivetti Challenge

OLIVETTI HAS announced the launch of its 1010 system and has thrown down the gauntlet to IBM and Wang in the area of word processing.

The 1010 is a completely new approach to word processing in that the highly successful Olivetti electronic typewriter can act as both a keyboard and printer for the system.

Peter Hatch, marketing director of Olivetti office system division, says: "This move is an entirely logical one for us.

"We're taking orders at a rate of 500 per month for our electronic typewriters, and we can now offer a complete upgrade path for all of our ET users — in the initial stage to a single workstation, then to a shared resource system and finally to a multi keyboard, hard disk network."

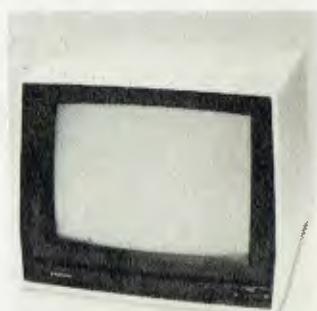
The Olivetti 1010 system is totally upgradeable in both its hardware and its software. This offers the user a path to multi keyboard systems, large storage of data and future enhancements of electronic mail, electronic diary and calendar features and communications. □

Imagineering

IMAGINEERING is a microcomputer systems house, specializing in Apple computer applications.

contested personal computer market.

Mr. Mike Barracough, a Director of TCG, said: "The systems were originally designed to provide versatile computing facilities, economically, to first-time users, students and hobbyists. Our new pricing will maintain that initial concept." □



Upgraded Monitor

SANYO OFFICE Machines Pty Ltd has added a new data display monitor to its range of computer products.

Model DM 8112CX features a high resolution capability of 850 lines at centre and improved visibility at the edges due to its 635 micron radius, resulting in a flatter screen surface.

This feature reduces distortion at the screen's edge, and is said to be particularly important when used in applications such as an 80-column word processing screen.

A P31 green, non-reflective screen is used in the new monitor to provide better eye comfort for the operator.

Mr Roger Price, Sanyo Office Machines' DP product manager, said the DM 8112CX had been designed to meet the needs of OEM computer and data processing companies. The monitor's styling would enable it to be matched with most of the related hardware being produced today.

DM 8112CX has a recommended retail price of \$320 plus tax. □



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Fault Analyser

HYPERCOM, Australian manufacturer of the locally designed Speakeasy range of business computer and data phones, has developed a computer software program which automatically tests the product for operational faults, analyses the problem and then pinpoints the probable fault.

The software, called ATS 11 (Automatic Testing System) was written by Mr. Paul Walner, manager of Hypercom Data Products, and runs on an Ohio Scientific Challenger computer.

"Using ATS, 5000 tests and measurements are being performed every second. In effect, 100 points are checked 50 times every second. It would be impossible to achieve manually," Mr. Walner said.

"The computer's accuracy is such that 90 percent of the time it will give specific errors and ten percent of the time it will suggest a variety of possibilities from which we can quickly isolate the problem," he said.



New ADE's

TWO NEW small DEC-compatible business systems, which allow the user to alter and configure on-line storage capacity to suit his requirements, have been released through Australia and New Zealand by Anderson Digital Equipment.

Aimed at the small business market, the systems, ADE VT 11 and ADE VT 23, also combine the latest in Winchester/floppy disk technology, while at the same time remaining compact desk-top or table units.

Both can be configured by the user to become a complete LSI-11 microcomputer system, simply by adding optionally available modules. The smaller of the systems, the ADE VT 11/440, sells for the pre-sales tax price of under \$10,000; the larger ADE VT 23/880 is under \$18,000.

Adventure Quiz Ends

SORRY FOLKS, the Adventure Sampler Competition is over and the panel of judges (the boss) has decided the winners.

The competition, launched in the August issue of *Your Computer*, generated some very interesting entries. It's unfortunate we are unable to give prizes for the most outrageous and silly letters we received.

Here is a list of those lucky people who won Adventure Samplers:

S. C. Jezioranski, 11 Orsova St, Bridgewater, SA.

L. Horwood, Childers, Qld. Johnathan Chey, Borrowdale St, Red Hill, ACT.

Greg McPherson, Pleasant Rd, Bulleen, Vic.

Peter Spratt, Sixth Ave, Loftus, NSW.

Vincent Lamberti, Reaburn Cres, West Brunswick, Vic.

The Hannon Family, Chant St, East Launceston, Tas.

Wayne Carson, Somerlayton Cres, Fawkner, Vic.

Daniel Hunter, Carrara Rd, Rowville, Vic.

Grantley Filips, McMahons Rd, Ferntree Gully, Vic.

M. Brandon, Vernon St, Greystanes, NSW.

S.J. Miller, Wynnum Rd, Tingalpa, NSW.

Bruce Gould, Holzgrefe St, Millicent, SA.

Randall Gallimore, Berkeley St, Mayfield, Newcastle, NSW. Thank you for your entries. Your prizes, which are being organised through Compshop Australia, will be sent to you shortly.

Word Productivity

PRODUCTIVITY benefits available from word processing systems can be "substantially increased" by the installation of an optical character reader (OCR), according to a survey conducted by the US-based Hendrix Corporation.

Hendrix, which claims to have 75 per cent of world OCR sales, surveyed 100 of its OCR users to examine the successful performance of additional applications on word processing systems using OCR.

"Based on the survey results, there is no question that many additional applications are being implemented on word processing equipment as a result of using OCR," Hendrix spokesman said.

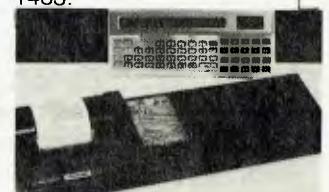
OCR is designed to improve the productivity of word processors making it easier for additional applications to utilise the word processor. Time-consuming, costly and redundant steps such as re-keyboarding, which remove the basic editing power from workstations, are eliminated.

The OCR reads the material and automatically sends it to the word processing workstation with no WP operator re-keyboarding required.

implementation of the IEEE-488 interface and optionally, the RS232 interface.

When in operation, the Softbox becomes a micro-computer, controlling the system and running CP/M using the system's own disk drives. The existing system's VDU is then configured as a CP/M VDU. This system is suitable for the Commodore micro-computer, Hewlett-Packard and the Tektronix instrument controllers.

For more details, contact Bill Saunders at BS Microcomp, 561 Bourke St, Melbourne. Phone (03) 64 1433.



Computer Hotline

TANDY ELECTRONICS has established a 'Computer Hotline' so TRS-80 owners, even in the most remote areas of Australia, can obtain instant computer support for the cost of a local telephone call.

By dialling 008-22-6366 from anywhere outside the Sydney metropolitan area, TRS-80 users can obtain skilled help with any problems they may have with any Tandy hardware or software.

Trained staff man the Hotline telephones from 9 am to 5 Monday to Friday, at Tandy's Computer Support Division at Rydalmer, NSW. Callers in Sydney and surrounding areas should ring 638-6633 and ask for the Computer Hotline.

Tandy has also released a miniature printer and cassette interface combination to suit the TRS-80 pocket computer.

The tiny printer outputs 16 alpha-numeric characters per line, with automatic wrap-around of lengthy text to the next line. Data printouts and program listings are printed in easy to read dot matrix characters.

you can have your apple....

Now you can give your single task Apple Computer a dual task capability... tempting?

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Microsoft Typing Tutor II	\$ 25.95

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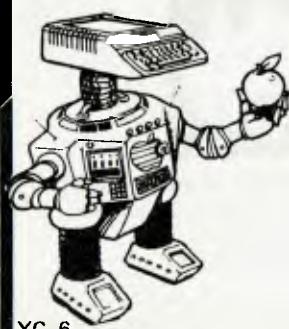
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YC. 6

your computer news • your computer

Easy Query Language

MOST SENIOR managers who are not also programmers know there is a lot of valuable information buried inside their company's computer. The problem has been, how to get it out in usable form?

Perkin-Elmer Data Systems is said to solve this problem for users of their 32-bit Megamini systems running on Reliance software, with the introduction of RQL/32 — Relational Query Language.

From a simple set of menu directed commands, RQL/32 feeds the executive answers he likes to have on a day-to-day basis. There is no need for special programs, no hanging-up programmer's time or the computer. The language interacts directly with Reliance, and returns the answer via a video screen, a printer, or both.

The executive can thus seek information stored within the data base literally minutes before a meeting, and take with him a print-out of answers.

Security features of RQL/32 include limited access at differing levels of security and privacy; at the transaction level, the file level, and the field level.

Interactive queries and report specifications can be saved for later use, a particularly useful function for the routine production of reports requiring periodical updates.

in irretrievable data loss. Such a loss for a company using a mini-computer for its accounts, without duplicate or back up data, would threaten the viability or bankrupt the company.

Mr. Mollema said 3M's Scotch brand data recording products were designed to give reliable performance and data security. He said 3M's Data Shield Service combined cleaning and inspection of disk packs and data cartridges by expert servicemen, while Scotch brand Diskette Head Cleaning Kits, for operator use, ensured diskette drive read/write heads could be cleaned frequently without abrasion.

BDS into Qld

BDS COMPUTER Australia Pty Ltd has opened a new branch office in Brisbane.

Headed by Alan Roberts, the branch will provide marketing, sales and service for BDS's complete line of plug-compatible printers and controllers in Queensland. Mr Roberts previously held management positions with Digital Equipment Australia Pty Ltd and Hartley Computer Pty Ltd.

"The new branch reflects BDS's increased business activities in Australia," said John E. Price, BDS's managing director. "It will enable BDS to provide closer customer sales and engineering support to satisfy the high demand BDS is experiencing in Queensland."

The new branch is located at 11th floor, 127 Creek St, Brisbane. Phone (07) 221 8642, Telex 40570.

BDS has also expanded its activities in South East Asia. John Price recently completed a trip to the area, where existing agency relationships were extended and several new agents were appointed.



Fail-Safe Entry

THE TCG Group of Sydney and CAS (Computing Accounting Services) have developed and successfully pilot tested what is claimed to be one of the most advanced portable data entry applications available for small business.

Highly developed software programming provides the small businessman a fail-safe method of inputting debtors, sales analysis, stock reporting, creditors, general ledger and financial reporting data.

Two major systems, CASPAK, a debtors, sales and stock system, and CASGEN, a creditors, general ledger and financial reporting system, have been incorporated into the program using a Norand Alpha-1 Route Commander PDE unit in a briefcase.

The program was developed following a move by CAS to expand its existing computer services designed primarily for medium to large businesses. □

Memorex Surge

MEMOREX, the Australian arm of the US Memorex Corporation, has announced excellent trading results for the local operation.

Managing Director of the Australian subsidiary, Mr. Gary Ghent, has reported a pre-tax profit of \$708,000 for the quarter ended September 25, 1981.

He also announced a total pre-tax profit of \$2,117,000 for the last twelve months trading period.

Mr Ghent said the quarterly result was the highest profit recorded for any quarter since 1978. □

Cromemco Launch

CROMEMCO is to enter the desk-top computer market, with the introduction of its new System One computer.

The System One, it's claimed, offers sophisticated features and performance capabilities at one of the most competitive prices currently available for a microcomputer system with the multi-user capability.

Designed for both multi-user and single-user applications, the System One also provides substantial room for expansion, so the machine can be configured to meet individual requirements.

Consequently, the System One is regarded as well suited for business applications, and a wide range of professional applications, including engineering, science, medicine, and education. □

Honolulu Offer

ADLER IS again offering a free overseas airline ticket with the lease of every new SE 1010 and SE 1030 electronic memory typewriters. This time, the destination is Honolulu, and the carrier is Air New Zealand.

Jim Wallis, Adler's Managing Director, said: "There's

no lottery, or guessing competition. Everyone is a winner and the restrictions on times of flying are minimal."

The bonus is transferable, at the buyer's option, and flights can be boarded in Melbourne, Sydney and Brisbane.

There is a similar free travel offer on Adler word processors.

The offers last until December 15. □

Dust-Free Floor

A QUEENSLAND company says it has the answer to keeping floors of computer rooms dust-free — use Pyneboard's Structaflor.

Birns Distributors of Brisbane recently bought a computer for its accounts section and was faced with the option of stripping all the carpet out of the room to reduce dust. The problem was avoided, said company manager Bill Massie, by laying Pyneboard's 20mm square edge 450 Structaflor over the concrete in the computer area, and retaining the rest of the carpet.

The Structaflor was glued down, sealed, then coated with polyurethane. □



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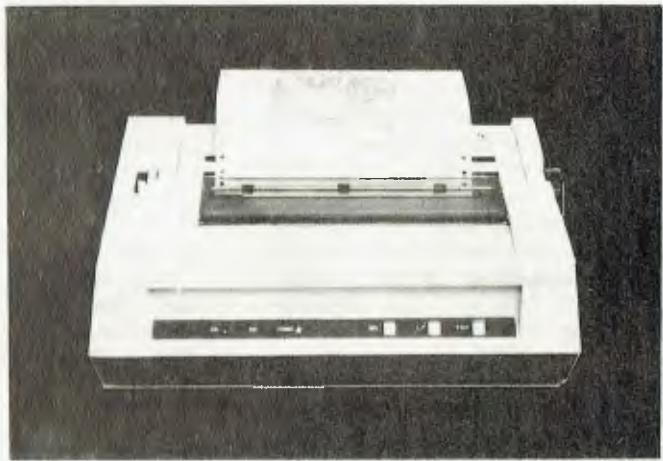
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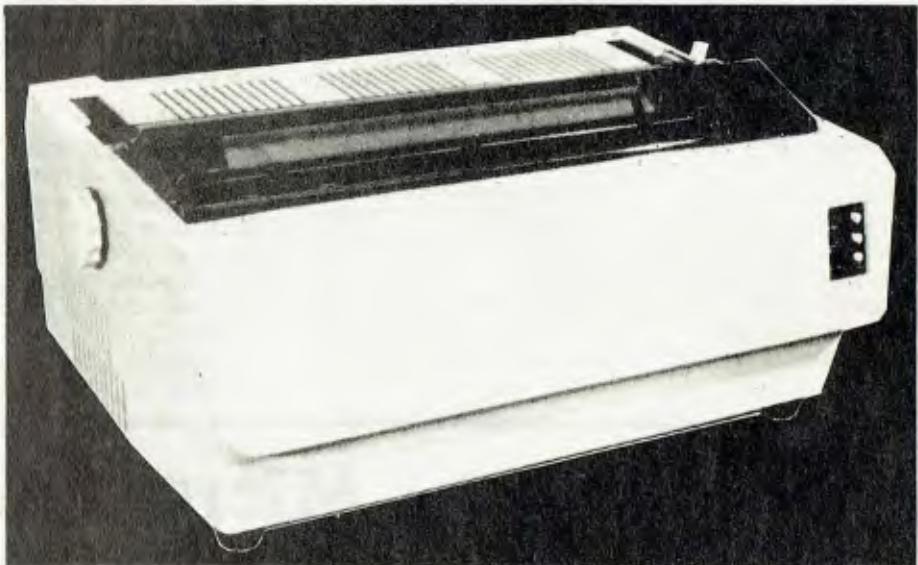


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KIT COMPUTING

- doing it by numbers.



COMPUTERS ARE complex beasts, let's face it. When you buy your first computer, its operation is a bit of a mystery at first, and you think you'll never understand it. But slowly light begins to dawn, and after a while, it's all straightforward.

I guess I'm luckier than the average computerist — having built my own system, I can modify it, fix it, alter it, and generally work much more closely with the machine than would otherwise be the case. This is the major advantage of building your own system — it's not just that it's cheaper, but you do learn a lot more about the machine. From then on, it's not so difficult to install special software, customise the I/O drivers and generally solve those awkward little problems.

But there are other advantages to building your own computer from a kit. There's the sense of achievement, the satisfaction of having built it yourself. There's something special about a machine you built yourself.

There are considerable cost savings, too. In most cases, the cost of a computer in kit form is much less than the same machine fully assembled and tested. And of course, there's the learning experience — not about the machine itself, but about the underlying principles of computer and microprocessor operation.

In this article, we review some of the major kits available from Australian suppliers. Best known perhaps is Heathkit, long regarded as the benchmark against which other kits are compared. The Heath/Zenith 89 is a self-contained com-

puter with integrated terminal and disk drives, which has found enormous success in the USA.

Dick Smith Electronics sells kits of the Super 80, a constructional project from Electronics Australia magazine. This is a self-contained single-board machine based on the Z80 microprocessor, and includes BASIC in ROM. It also offers "S-100" expansion.

The Dream 6802 from J4 Components is based on the Motorola 6802 microprocessor, and includes a video display and an interpreter for the Chip-8 language, a kind of 'friendly assembly language'.

SWTPC's 6809 system uses the popular (and powerful) Motorola 6809 microprocessor, and is available in basic form with 8K of RAM. It is much more like the conventional notion of a computer as a box onto which one attaches a terminal and other peripheral equipment.

When contemplating the purchase of a computer in kit form, all the usual laws and rules of thumb apply. We've covered those elsewhere, so I don't propose to go into them here. In addition, there are some other considerations:

- Objectively rate your own skill as a kit builder. If you've never built anything before, don't start with a complex kit.
- Do you have the right tools for the job? You'll need a high quality soldering iron, preferably temperature controlled; fine-nosed pliers and snips, a magnifying glass (for inspecting boards), a selection of screwdrivers and pliers and miscellaneous,

ous, more conventional tools.

- What sort of test equipment do you have? To fault-find on complex digital equipment, you'll need at least a multimeter and a logic probe and a lot of patience and luck. If you don't have the patience or luck, you'll also need a high-speed dual trace oscilloscope. A frequency meter can also be handy.

- Do you have an understanding of digital electronics? If you don't when you start, there's a good chance you will by the time you finish. If, at the end, you still don't know much about logic, the chances are your kit doesn't work, so you don't need the knowledge anyway.

- Will you have the time to devote to building the kit? Even building the H-89, which is mostly mechanical assembly work, takes over 20 hours. If you don't have the time, consider carefully — you can't rush a job like this.

Years ago, for beer money while I was at university, I used to assemble Sinclair calculators from kits and sell them at a modest profit. On average, they took about an hour and a half to assemble. I did one in an hour once, although it looked okay, it never worked reliably; the keys just weren't right. That's what happens when you rush.

Check what provision the supplier has made for servicing kits that just won't work, despite your best efforts. Most companies can service kits or replace them, for a fee. Maybe you just need some advice.

Super Instructor 80



The most popular kind of computer in the early days of personal computing was (maybe still is) based on the S-100 bus. That's a kind of 100-wire telephone line that lets the various boards which make up the computer talk to each other. LES BELL examines a locally made computer of this type.

APPLIED TECHNOLOGY has been involved with microcomputers in Australia since the very beginning. Through kits based on the SC/MP and 2650 microprocessors, it has introduced thousands of electronics hobbyists to the joys and agonies of computing.

Its latest line of products is based around the S-100 bus. This is a set of signals which are carried from board to board, and allow the processor (on one card) to talk to the memory (another board, or boards), the video screen

(another board), and the input/output ports (yet another board).

The great advantage of the S-100 bus is the versatility it lends to a system. You can, within certain limits, mix and match boards from different manufacturers, to provide the widest range of technically advanced memories and peripheral circuits.

Its disadvantage, according to many critics, is its cost. Yet purchasers frequently find that the higher initial cost of the system is offset by the lower cost of add-ons, such as disk drives and memory.

To return to the subject at hand, no-one could criticise the Applied Technology entry level system on the grounds of its high cost. For only \$399 you get a complete working computer. In this review, I'll treat the individual parts of the system as separate items.

DG-Z-80 CPU

The DG-Z-80 board is the heart of the system, based on the Zilog Z-80 microprocessor. It's an S-100 card, and on its 1277mm by 254mm (approx) area, there is the CPU chip with its clock, two

fully programmable parallel ports, an 8-bit unlatched input port, four counter/timer channels (one dedicated to a real-time clock), a programmable interrupt controller, a software controlled write protect circuit, a power-on jump circuit, 2 Kbytes of EPROM containing the DGOS monitor, and 2 Kbytes of RAM. That's a heck of a lot on one board!

Because of its complexity, this is not an easy kit to build. The printed circuit board is very dense, and I couldn't recommend it as a project for the novice. In addition, this board is sufficiently complex to make troubleshooting a nightmare for the inexperienced. Troubleshooting this kind of board also requires fairly sophisticated test equipment.

The board uses a Z-80 PIO to provide the two programmable I/O ports, allowing the maximum of flexibility. The ports are connected to two 16-pin DIP sockets, one of which is set up for use as the keyboard input port. One of the counter/timer channels is set up by the DGOS monitor for use as a real-time clock, but the rest are completely available to the user.

MW640 VDU

The MW640 video display board is a redesigned version of the earlier DG640, using the newer 2114 RAM chips. The 640 is a memory mapped video display; that is, the processor displays characters simply by writing them into memory. While the processor is not accessing video memory, the display circuitry has full access to the memory, and the processor is unaffected since the video memory is tri-state off the bus. This means that, unlike the Super-80, the VDU circuitry does not hold the processor up.

This board provides a 64 x 16 display of upper and lower case characters, with full descenders. In addition, characters can be displayed in inverse video (black on white) or flashing. As well as the standard character set, the MW 640 offers either Greek or mathematical symbols. In graphics mode, each character cell can be split into eight separately controllable pixels in a 2 x 4 matrix. This allows quite sophisticated graphics to be generated.

For the user who needs very high resolution graphics, or has a requirement for an unusual character set, an extra board called a programmable character generator (PCG) can be used. This replaces the conventional character generator ROM with RAM so the user can change the character set at will. The PCG allows some remarkable graphics to be generated.

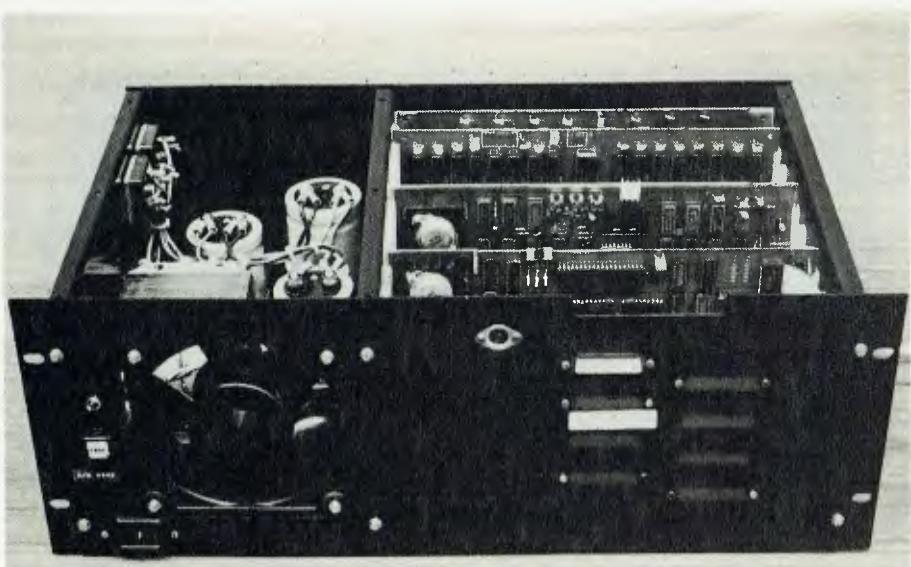
Driving It

Since the 640 is memory mapped, it requires a program to move the cursor around and write characters on the screen etc. These functions are supplied in the DGOS monitor ROM which plugs into the CPU ROM socket. This monitor provides the usual functions, plus some others which are quite unusual. Memory examine and modify, memory fill, go to an address are all fairly standard. There's also a block move command, which can sometimes be useful.

The P command clears the VDU screen. Two commands relate to the real-time clock. The I command inhibits the operation of the clock, as is operation conflicts with some programs, and the T command sets the time.

The Search command allows the user to search through programs looking for certain instructions — a real help if you've got to modify I/O drivers or some other code which you didn't write yourself. With the addition of a matching cassette interface, the system can read and write cassette tape files, using the R and W commands.

The memory protection circuitry on the CPU allows the user to write-protect 256 byte blocks of RAM. The circuitry uses a RAM to identify which blocks of memory are protected, and commands in the

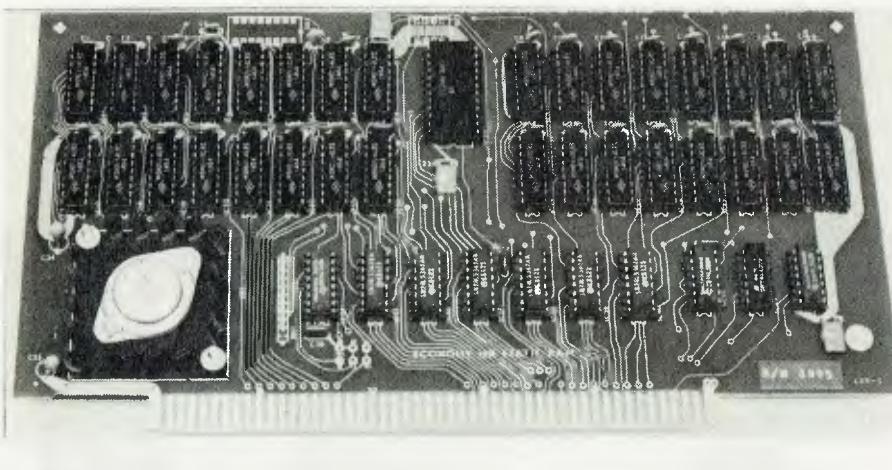


The upmarket version, using the same boards but in a fully expandable S-100 system with power supply and cooling fan.

Specifications and Report Card

Unit:	Super Instructor 80
Made By:	Applied Technology
Processor:	Z-80A
Clock Speed:	2MHz or 4MHz
RAM:	2K on-board, up to 64K on RAM cards
ROM:	2K on-board, up to 16K on each ROM card
I/O:	3 parallel ports, optional cassette i/f, VDU
Languages:	Machine code, Assembler, BASIC
Keyboard:	RCA elastomeric up to full QWERTY typewriter type
Display:	64 x 16 U/L case
Graphics:	128 x 64 chunky graphics
Peripherals:	Optional cassette i/f, disks
Expansion:	S-100 bus
Best Points:	Multiple functions on CPU board
Worst Points:	CPU board has trouble interfacing to some cards

Ratings:	excellent	good	well, maybe	poor
Documentation		✓		
Ease of Use		✓		
Functionality	✓			
Support	✓			
Value-for-money	✓			
Price:	\$399			
Review unit from:	Applied Technology			



monitor allow the user to set and clear protection, and to display the contents of the protection system.

The system as described this far is all that is required to operate a real working computer. Using DGOS and the memory on the CPU board in conjunction with the VDU board, the user can write and execute machine code programs. This is sold as a system, complete with keyboard and motherboard (which is the physical bus that links the boards together), and called the Super Instructor 80, for \$399.

To obtain the real benefit of the system, however, the user will need additional memory — which is where the AT16K RAM card enters the picture.

16K RAM Card

The AT 16K RAM card uses 2114 static RAMs to provide a 16K block of memory which can be located at any boundary in the address space of the processor. It incorporates some of the more recent innovations which have made the S-100 bus so advanced, such as PHANTOM ad-

dressing (makes the RAM disappear when it's not wanted) and bank selection, which allows several boards to share the same address, typically in a multi-user system.

There's not a lot to say about memory, except that it remembers, and this one seems to do that quite well. With its advanced features, it should see the user into much bigger and more advanced systems.

Matching the 16K RAM card is a 16K ROM card, which can be supplied complete with a 12K BASIC interpreter in ROM. This is Microworld Level II BASIC, which bears considerable similarity to the Super 80's BASIC. In fact, they're both based on BASIC ETC, by Whipple and Arnold.

Microworld BASIC includes a number of special instructions designed to complement the capabilities of the DG-Z-80 and MW640. There are statements to clear the screen, set the speed of a listing, initialise the PCG, set output to be inverse video or flashing, set, reset or test any graphics points on the screen and return to DGOS.

String handling in Microworld BASIC is based on the Hewlett-Packard/NorthStar style, with what appear to be some extensions. The manual points out how to simulate LEFT\$ and RIGHT\$, making translation of MBASIC programs easy.

The Microworld BASIC manual is quite comprehensive, and includes examples of the non-standard statements where required, as well as a selection of programs in an appendix (including the program which produced the index for the manual).

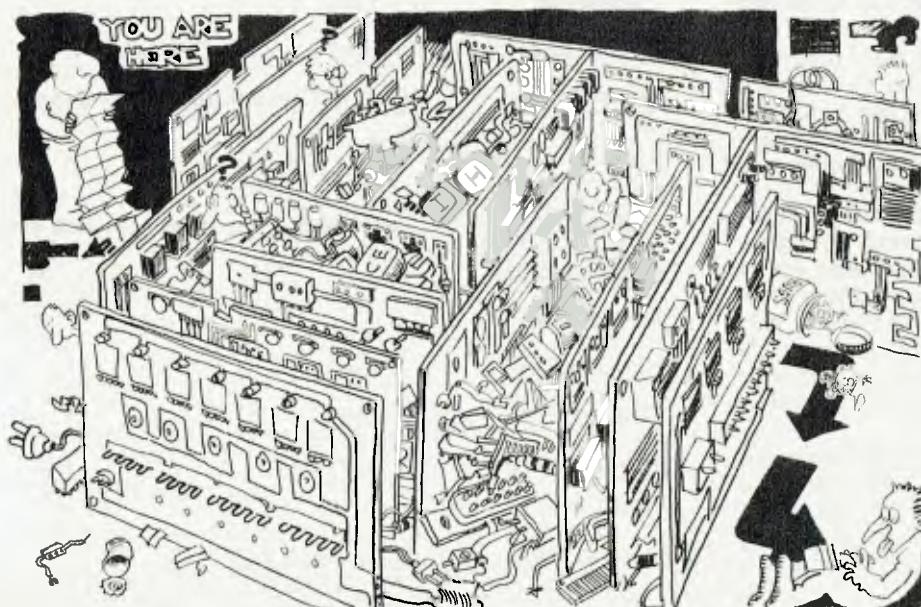
The Whole System

The documentation for these boards is terse, and really best suited for the advanced computerist with some hardware expertise, or for the electronic hobbyist. If you don't fall into either of these categories, it might be advisable to have a friend around who does.

The boards can be put together using the MW1550 motherboard and a suitable power supply to form a complete computer system. Although it uses the S-100 bus, it does not meet the IEEE 696 specification for that bus, and could not be said to be a 'pure' S-100 system. In particular, care should be taken when purchasing dynamic RAM to run with this CPU.

However, for most users this will not be a problem, as they will select from Applied Technology's range of boards, all of which will work with the DG-Z-80. Among these are some interesting items, such as a speech synthesizer board.

The system provides plenty of room for expansion to include disk drives and other mass storage, so that the user need never feel that he has to 'trade up' to a bigger system. The Applied Technology series of boards should take the user right from a small beginners' system through to a large and comprehensive business system.



The Super 80 Computer

The Super-80 Computer was recently featured elsewhere as a constructional article. Now a kit is available from Dick Smith Electronics, and it seems set to cause a small revolution, as LES BELL reports.

ALL THE action in the computer marketplace these days seems to be at the bottom end. What with the ZX-81, the VIC and other low-cost systems, computers are becoming almost as cheap as calculators.

Latest in the progression of low-cost systems is the System 80, sold in kit form by Dick Smith. (What do you mean, "Who"?)

Described in 'Electronics Australia' magazine, the Super 80 is based on the Z-80 microprocessor, and includes memory, display, keyboard and cassette interface. As many readers will know, I used to sit on the opposite side of the fence from 'Electronics Australia' magazine, at 'Electronics Today International,' and I often used to wonder what they were doing, playing around with SC/MPs and 2650s. But I do think that with the Super 80, they've got a real winner.

The computer is based on a single board — although the keyboard part can be sawn off and mounted separately. At the front is a 60-key keyboard — a proper keyboard too, one you can type on, and not one of those elastomeric types.

Behind that is the main logic area of the computer. There's a Z-80 processor, and sockets for up to 48K of dynamic RAM. This is enough to accommodate most needs.

The video circuitry is clever, but provides only a 32 × 16 upper-case only display. It is the only serious limitation in what is otherwise a well-conceived machine. Still, within the cost constraints for this type of machine, it would be hard to come up with a more versatile design.

When the screen needs refreshing, the video circuitry tri-states the processor off the bus, and using an address register and counter circuitry, it proceeds to display the contents of memory on the screen. When the end of the display part of

```
SUPER-80 V1.2  
SUPER-80 BASIC VER 1.2B  
READY  
*10 PRINT "YOUR COMPUTER"  
*20 PRINT "ISN'T AS GOOD"  
*30 PRINT "AS MY COMPUTER"  
*RUN  
  
YOUR COMPUTER  
ISN'T AS GOOD  
AS MY COMPUTER  
  
*-
```

the screen is reached, the processor is allowed back on to the bus.

What is interesting is the fact the address register of the video circuitry can be written to by the processor, allowing the machine to display any 512-byte section of memory. By switching rapidly from section to section, some tricky animated effects could be generated. Although with the restricted character set available, and no graphics capability, this is limited.

Clock Speed No Guide

Another side-effect of the video circuitry is it closes the CPU down for about half the time; one reason why clock speed is not always a good guide to performance for this kind of machine. However, it is possible to shut off the display whenever raw speed is required.

The refresh circuitry for the dynamic RAM is based on the Z-80's internal refresh counter. This gives rise to an interesting potential problem: although the System 80 sports an S-100 expansion circuit, that interface does not support DMA (direct memory access).

Now with 48K of RAM on that board, some users are going to want to add a disk drive. Here's where the problem lies.

Disk controllers come in two main types. The first type works by transferring all data programmatically through the processor. The software sets everything up ready for the data transfer, and then puts the processor into either an extended wait state, or a hold while it waits for the sector on the disk to spin around to the correct position.

During this time, the processor is not fetching any instructions, and consequently is not refreshing the dynamic RAM. If the time exceeds two minutes (as it often does — eight minutes is the average), then the dynamic RAM contents

wither and die. The second kind of controller does DMA transfers, and as we've already said, that won't work, either.

Of course, I may be wrong, but there is a potential problem there. It may be that an interrupt-driven disk controller will work okay; that seems to be the best prospect. And of course, foolproof dynamic RAM controllers cost more than the entire Super 80, so it's no great sin.

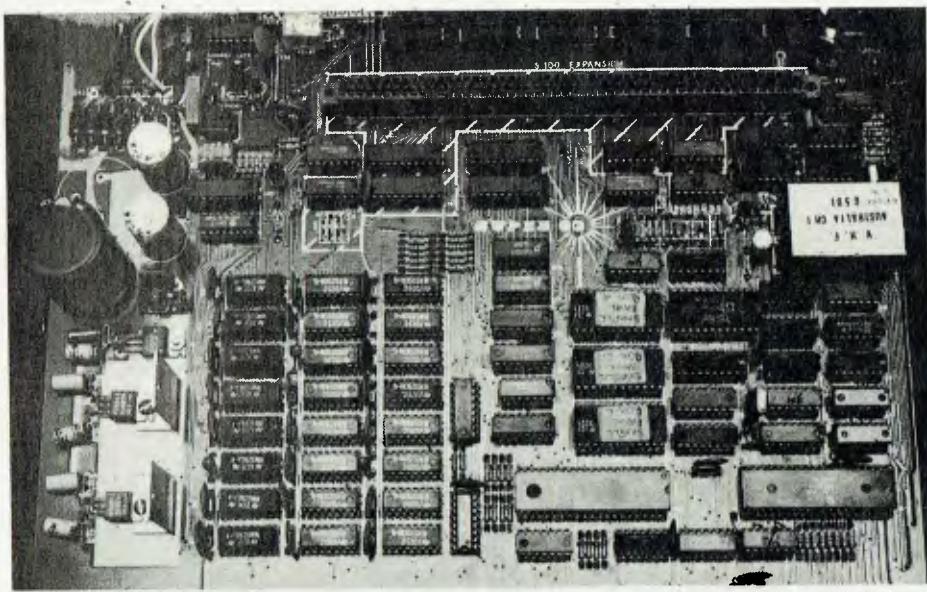
The optional cassette interface on the Super 80 uses the Kansas City tape format (for what that's worth) at 300 or 600 baud. The cassette circuitry blanks out the screen (it needs 100 percent of the processor's attention), but uses a flashing LED to signify correct operation. It includes a relay to control the tape deck's motion.

Software Too

A computer by itself is pretty dumb; it must have some software to go with it. The lowest level of software for the Super 80 is its monitor program, without which it will not work.

A monitor program — for those who have never used one — is a very simple program that provides the capability to input and output characters. It will also examine and change memory locations, (perhaps) load and save programs to cassette or paper tape, and (perhaps) examine and change the processor registers and execute a program. These are basically all the functions you need to write and debug a program on any computer.

The Super 80 monitor is 2K in length, which makes it fairly big. It includes all of the above commands (except register examine/change), plus the ability to input and output to/from any I/O port. In addition, there's a command which allows the user to control the output speed of running programs.



Specifications and Report Card

Unit:	Super 80 computer
Made By:	Dick Smith Electronics
Processor:	Z-80
Clock Speed:	2MHz
RAM:	16K up to 48K
ROM:	2K up to 12K
I/O:	Cassette interface, video output
Languages:	BASIC
Keyboard:	Basic QWERTY
Display:	32 × 16
Graphics:	What graphics
Peripherals:	None yet
Expansion:	Through S-100 connector
Best Points:	Low cost
Worst Points:	32 × 16 display

Ratings:	excellent	good	well, maybe	poor
Documentation	✓			
Ease of Use		✓		
Functionality	✓			
Support		✓		
Value-for-money	✓			
Price:	\$289			
Review unit from:	Dick Smith Electronics			

A second, even more important function of a monitor, is to supply useful subroutines which can be used by other programs to perform standard I/O functions. The Super 80 monitor, for example, includes a simple line editor, which can be used by applications programs to edit line input. There's also cassette I/O routines, message printing routines and a number of other useful utilities. The Dick Smith Monitor Handbook gives full details of these routines, including entry points and conditions and memory usage.

BASIC, With Chips

The BASIC for the Super 80 comes in two forms: on a cassette tape, or in three EPROM chips, which can be plugged in to replace the Monitor program. The Monitor is contained in the chips along with BASIC, so you don't lose it.

The cassette version of BASIC takes about two and a half minutes to load, which is not bad at all. (My old cassette BASIC used to take nine minutes, just long enough for coffee and port to help the evening's programming).

Most owners will go for the EPROM BASIC, though, for the convenience of a bomb-proof system, as well as the time advantage.

Super 80 BASIC is an extension of an extension of the original Tiny BASIC Extended (see Dr Dobbs Vol 1, nos 1 and 2), written by Dick Whipple and John Arnold. Although TBX was only 2K in length, Super 80 BASIC has grown in length to 9K, so it has many more functions and commands.

Both real and integer constants and variables are supported, although mixing modes can lead to errors. Multiple statements per line — separated by colons — are possible; and there are some nice touches in the interpreter. Formatted printing is supported, for example, and string handling follows the Hewlett-Packard/NorthStar convention.

Logical operators (AND, OR, NOT) are provided, and there are some special commands which relate specifically to the Super 80. For example, the MON command will execute a single monitor command from inside BASIC, while the CURS function can be used to place the cursor at any location on the screen.

An interesting feature is the provision of a NEXT* statement, which allows exiting from within FOR..NEXT loops by tidying up the stack.

Overall, this is quite a powerful implementation of BASIC, with very few shortcomings. Although non-standard (that is non-Microsoft standard) in some areas, it should prove easy to adapt programs written for other machines.

The Vital Words

The documentation supplied with any computer system is a very important part

of the system. Bad documentation can render a system useless. But this certainly hasn't happened with the System 80.

We were supplied with four manuals with the computer, ranging from the Assembly manual to the BASIC Handbook. The assembly manual is based on the material in 'Electronics Australia' magazine, and provides a comprehensive description of the machine in fairly non-technical language. Though for the bamboozled, there's a glossary at the back.

The monitor handbook provides a complete rundown on the monitor functions and facilities, while the BASIC handbook provides both a tutorial introduction to and semantic/syntactical description of the BASIC language used.

Technical Gem

The technical manual is the real gem, however. While not quite up to Heathkit standard, it is one of the best documents of its kind I've seen.

The author has devoted considerable effort, before starting writing, to breaking the Super 80 circuit down into 104 Testable Circuit Elements. The construction method is to build one TCE at a time, and get it working, before moving on to the next. In this way, whenever a problem is encountered, the builder knows exactly where it is.

For each TCE, a test is given to check the operation of that element, together with a probable cause if the test fails. At the end of the assembly and testing, the

user is left with an operative computer.

If all that should fail however, there's always the 'Sorry Dick, It Doesn't Work' coupon.

The printed circuit board is complex, with many closely spaced runs and it would be easy to produce shorts were it not for the solder mask.

Even then, it will still require neat work. This probably is not a kit for the absolute novice. □

Heath Zenith H89

The name of Heathkit is virtually synonymous with the high-quality kits of all kinds of electronic equipment, including computers. Their range includes the H-8, the bus-structured front-panelled computer that was earlier withdrawn and then re-introduced by popular demand; the H-11, which is based on Digital Equipment's LSI-11 microcomputer; and the model reviewed here by LES BELL, the H89.

Computer In A Box the Heath Zenith 89

THERE ARE a few companies which have kept the computing community guessing as they secretly prepared to introduce a new production line — among them IBM, Texas Instruments, Hewlett-Packard and Heathkit. We don't know yet about IBM, but of the rest, the most successful seems to have been Heathkit.

Around the time Heath introduced its computer line, it was sold by its parent company, Schlumberger, to US television maker, Zenith. Sensing the possibilities of the computer line, Zenith singled Heath out for special treatment, including the setting up of a special division, Zenith Data Systems, to market assembled and tested systems.

The Zenith Z-89 computer, is identical (except for the nameplate) to the Heathkit except the H89 comes in kit form. It is only available here as a complete unit at the moment.

The H89 is a self-contained computer, with a Z-80 central processor, and another Z-80 as the terminal intelligence. The terminal section of the H89 is avail-



able separately, as the H-19, a smart terminal which emulates the operation of the DEC VT-50. In the H89, the computer and the terminal are in fact logically separate, with only an RS-232C connection between them.

The H89 comes with two memory sizes; 32K and 48K of dynamic RAM. There's also 8K of system ROM and RAM, presumably for device drivers, disk bootstrap, monitor program and miscellaneous bits and pieces. The Z-80 processor runs at 2.048 MHz, so it's not as fast as some systems, but not as slow as many others.

The display is standard 24 by 80, with a 30.5cm diagonal green phosphor screen. Both upper and lower case are provided, and there is a graphics mode. A more-than-full complement of editing functions is provided, including relative and direct cursor addressing, tabbing, insert and delete line/character and a set of erase functions (should be great with WordStar!). Inverse video is supported, and there's an audio beeper for the BEL function.

The keyboard is excellent, with 84 keys, including 12 control keys and 12-key numeric/cursor control pad. The numeric pad can be used either for cursor control, or optionally, as a set of programmable function keys, through software programmability.

There are also eight user-definable keys on the top row of the keyboard. In the model we tried, the keyboard didn't fit exactly through the case, and the ESC key stuck down when pressed — a problem easily rectified.

Above the keyboard and to the right of the CRT is a single Wangco 13cm floppy disk drive. This offers 102K of formatted storage (reduced to 92K under CP/M). The controller doesn't use a conventional disk controller chip, but is based on 'semi-discreet' logic. The controller allows the daisy-chain connection of another two drives, or alternatively two 20cm drives can be added.

Also built in as standard are two RS-

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Electronics Australia/ DICK SMITH

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from \$295⁰⁰

If, like me, you are fed up with purchasing built-up products, here's your chance! Just imagine being able to tell your friends that you ACTUALLY BUILT your own full size computer — they probably won't believe you!

Very advanced design — but works with any TV set!

The 'Super 80' offers a specification that we believe just cannot be bettered at the price. It uses the popular Z80 Microprocessor IC, a professional keyboard and has a direct RF output so that you can use the computer with any TV set (you don't need to purchase a special video monitor).

Easy to build.

Even though we would not recommend this kit to the raw beginner, this kit is extremely straightforward and easy to build. Any person who can use a small soldering iron and can solder neatly should have no difficulty in construction. This is because of the unique double side board design which means there is virtually no other wiring. The board is covered with professional 'solder mask'; this makes soldering much easier without the problems of bridges, etc. Once the components are soldered onto the board in their marked positions over 98% of the construction is completed. Even if you cannot get the completed kit to work, we have a special "Sorry Dick it doesn't work" repair service to assist you.

Lower price, higher specification - how is it done?

Most computers sold in Australia are manufactured in the U.S.A. where extremely high labour rates prevail — and you pay dearly for this on built up units. With this computer kit, you provide the labour and therefore save a fortune. And remember, this computer does not have a small toy-like calculator keyboard but a full size professional typewriter keyboard.



Cat. K-3600

Inbuilt power supply: just add a transformer

Enormous 16K RAM on board lets you load large programs (pcb allows for up to 48K)

Inbuilt cassette interface: 300 baud Kansas City Standard allows you to load your BASIC interpreter from any cassette player. You can also swap programs

Full size professional 60 key keyboard allows ease of operation

THE ABOVE PHOTO SHOWS THE BASIC BOARD WITH THE FOLLOWING

Advanced programming capability.

One of the most popular computers in the world (the Tandy TRS80 Level 1) only has 4K of BASIC. The BASIC we have with this unit is a large 9K. When you consider that our popular Sorcerer computer (over 2,000 sold) only has an 8K BASIC and sells for over \$1,000, it is obvious that by building yourself, you are saving real money.

Electronics Australia/ Dick Smith design.

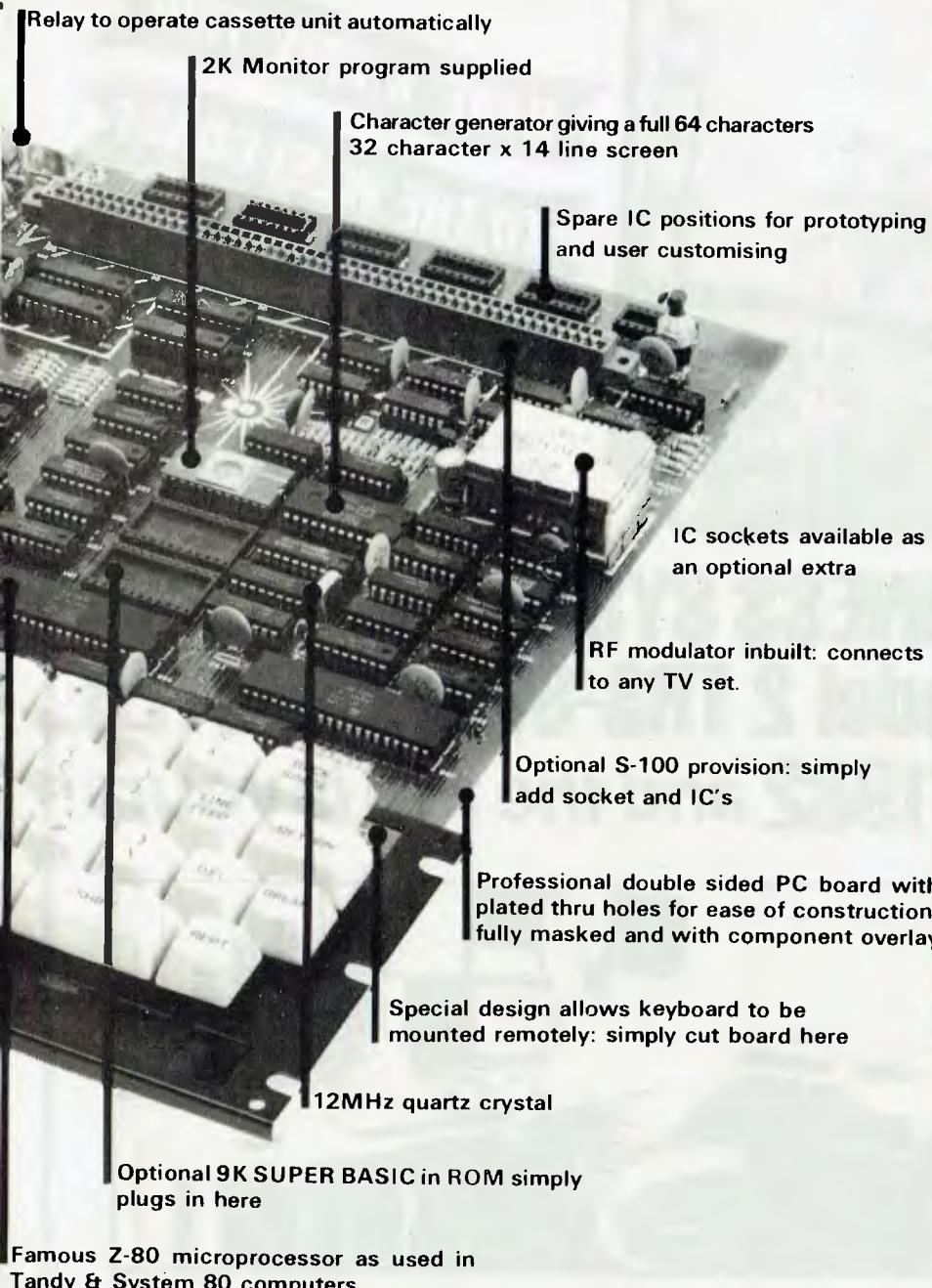
This is not a half baked design with no back up. The resources of Electronics Australia, Australia's most popular electronics magazine, and Dick Smith Electronics have combined to design and bring you this kit in the interests of computer enthusiasts actually building and not just buying. The design is fully Australian.

Imagine how much you will learn!

Most computer enthusiasts can program a computer but would have absolutely no idea of how to build one. By building this kit you will learn both the technical side of construction, how it works and then how to program. What a fantastic background for a future ...

Sectional construction.

We have designed this kit not only for the serious computer user but also for first time users like the student or hobbyist. This is why we have a short form kit which may be added to as you build (and as you have the money!). For example, you may build the computer originally and operate it with 'BASIC on tape' and then add 'BASIC in ROM', add the S-100 and provide other parts at a later stage.



Famous Z-80 microprocessor as used in
Tandy & System 80 computers

OPTIONAL EXTRAS ADDED: S-100 EXPANSION, IC SOCKETS, FULL 48K RAM

'Sorry Dick, It Doesn't Work'

All parts with this kit are guaranteed tested and new, but we cannot guarantee the labour content provided by you. If, after completion, your Super 80 fails to operate, you may take advantage of our 'Sorry Dick, It Doesn't Work' service.

Our Service Centre will check and repair your Super 80 for a lower than normal service fee. This fee includes any necessary replacement of components, etc.

If you send your Super 80 to us under the 'Sorry Dick, It Doesn't Work' service, it must have been constructed using IC sockets. If we receive a kit which does not use IC sockets, or if the kit is so badly constructed as to make effective repair impossible, we reserve the right to return your kit in the condition received, together with the service fee.

Under our 7 day satisfaction guarantee, you may return any kit in its original condition for a full refund of the purchase price. We cannot give a refund once construction has commenced, if any internal packs of components are opened or if the carton or kit is damaged.

7 DAY SATISFACTION GUARANTEE

Purchase this kit and inspect it for up to 7 days. If you do not wish to go ahead and construct this kit, simply return to us in condition as supplied and your money will be refunded in full.

DICK SMITH Electronics

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Mail Order Centre: PO Box 321, North Ryde 2113 Phone (02) 888 3206**

Comprehensive manuals available:

The construction details will be given in Electronics Australia magazine and full copy of the EA article will be supplied with each kit. We also have available two very comprehensive manuals to assist in construction and programming:

Combined construction, assembly and technical manual.



\$14.50

Super 80 Basic does this:

Over 50 separate versatile commands. Features: arithmetic and integer functions user-defined functions, machine language routines, text editing, string operations. Also contains 25 error codes to assist you in programming.

'Super 80 Basic' reference manual

Short Form Kit

Designed for computer applications where 'Basic' programming is not required. Kit supplied with EPROM Monitor and 16K RAM. Cat. K-3600

\$295.00

Add these items to make a fully operating computer system to your own requirements:

Transformer to suit	M-2325	\$23.00
BASIC program (interpreter) on cassette.....	K-3602	\$24.50
IC Socket set (recom.)	K-3603	\$12.50
BASIC program in EPROM (set of 3 IC's)	K-3604	\$99.50
S-100 Expansion	K-3606	\$19.50

Yes, this makes the full 16K computer with 9K basic on tape, transformer and IC Sockets — only — **\$355!**



DSE/A019/LM

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8 Order Entry Invoicing Stock

9 Word Processing

10 Mailing List Control

CONDITIONS

TRS-80 is a trademark of the Tandy Corporation. Offer valid only in States where it does not contravene the law. Offer applies to Systems paid for before February 7, 1982.



deForest Software

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MELBOURNE

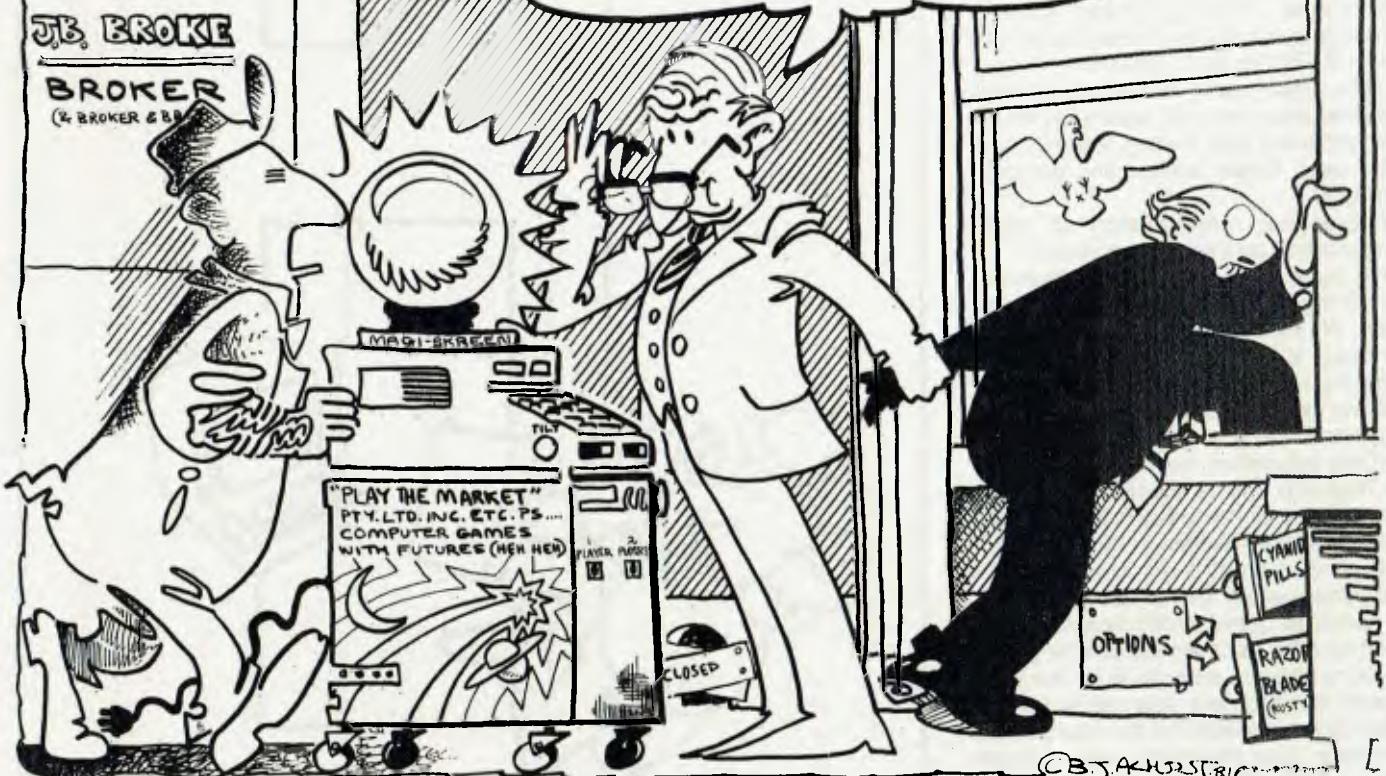
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(08) 268 8065

Lew Nyeholt
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HOLD ON J.B...
OUR FUTURES MARKET COMPUTER
HAS ARRIVED...



There's a Micro in your Futures

In the high-reward, high-risk world of the futures market, the investor would like every piece of information he can get, instantly. So a micro, some specialised trading software and a link to a market monitoring organisation are becoming necessities, as consultant GEORGE PHILIPPOU explains.

THE COMMODITIES, or futures market, is one area in which a microcomputer is accepted as a basic necessity, by both individual traders and fund managers.

This in turn has led to a rapid development microcomputer software/hardware that is in such demand it doesn't need be advertised, other than special-

ized journals like Commodities. Consequently, a majority of microcomputer users, or even retailers, are uninformed about significant advances in microcomputer applications.

Commodities are basic products, such as cattle, wool, wheat, gold, silver and plywood, whose sale/purchase is nego-

tiated at some future date at a specified price. In this manner, for example, a farmer may sell his crop and know his exact return; to him it means security.

The tremendous potential for profit, however, due to a low initial deposit of ten percent to secure the contract, means to a speculator that a rise/fall in overall price of

the commodity will result in 100 percent profit.

With astute traders able at times to return almost \$1,000,000 on a single commodity over an incredibly short period, it is no wonder many guaranteed software trading systems have been advertised from \$US500 to \$US1,000,000.

The actual role of the microcomputer in commodities may vary depending on the requirements and trading techniques of the user. These applications generally include:

- Graphical representation of price/volume data for trader interpretation.
- Analysis of price/volume data based on a trading system approach with generation of specific buy/sell signals. This method is most common and is called mechanical trading, since the trader allows the microcomputer to make the decisions. Dare he go against it?
- Data acquisition via modem.
- Real-time on-line display of data either in graphical or numerical format. This option is of main interest to the day trader. However, since it is not available to the Australian user, I will not elaborate.

Because of the wealth associated with commodities, facilities and private organizations catering exclusively for the Australian future traders have rapidly surpassed those available for the sharemarket investor, even though the latter has been in existence for a considerably longer period.

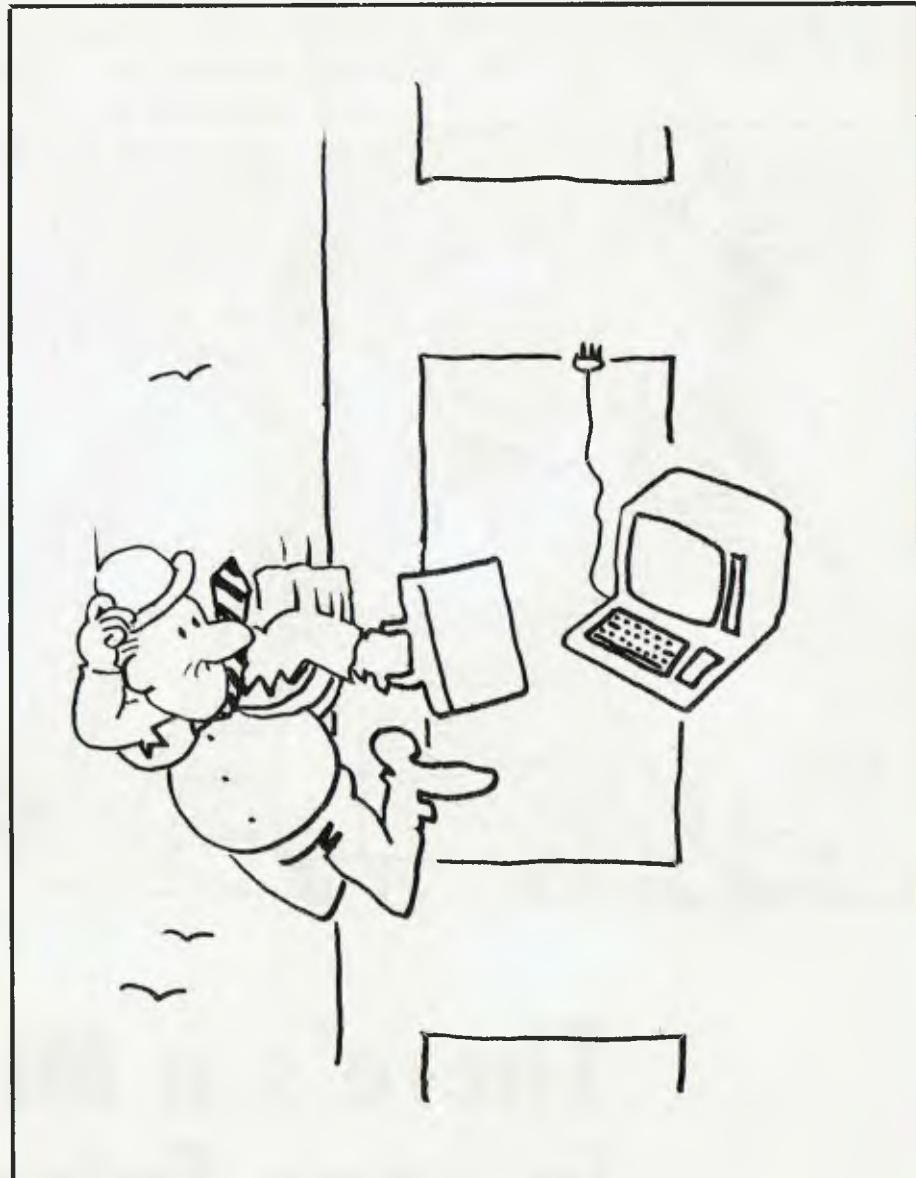
Through the use of acoustic couplers, a microcomputer owner may draw futures data either from overseas(USA,UK) or the local Sydney Futures Market. The main organization providing this service, Commodity Monitor of Spring Street, Sydney, has three updates on the Sydney market each day, as well as an overseas summary.

To perform its requirements, Commodity Monitor has entered into a time-sharing arrangement with Computer Accounting Services, a large mainframe computer organization which has branches in all the major capital cities. The user therefore need only make a local call to connect his microcomputer, via modem, to a specified file.

Commodity Research, of Pitt Street, Sydney, at present provides an overseas satellite link to a large USA data-base company, for users of the Computrac system (see later). Discussions with Commodity Research have revealed that data acquisition for the Sydney Futures Market, via a call to its Sydney premises, will soon be available as well as a more real time overseas line.

Increasing Use

While data acquisition by modem/microcomputer is convenient and facile, the extra added expense in hardware, re-



quiring \$700 to \$1000, and the preference of many traders to follow only a few selected commodities, has prevented its acceptance in Australia to the same degree as the USA, where some data-base organizations report a 750 percent increase by micro users since 1980.

While the options available for data acquisition are limited, the choice of a software trading system is only restricted by the imagination or finances of the user. If you are able to program, then an in-depth study of the numerous texts on the subject will furnish you with enough systems to quickly overload.

Without any prejudice, an extremely clear analytical approach is needed to finally settle on one. Some texts even contain program listings ready to be typed in—such as Trading Commodities by Microcomputers, by E.P. McDonald, in Tandy BASIC.

Alternatively, there is no shortage of software available for retail sale. In this respect, three main formats appear to be emerging.

- Purchase of software systems at reasonable cost—less than \$US500.
- Membership of a type of microcomputer software trading co-operative.
- Purchase of special software at around \$US3000, which according to many retailers almost guarantees your imminent retirement to a life of leisure.

For the microcomputer user who wants to start off in a small way and simply purchase a reasonably priced software program to obtain a feel for the subject, a number of specialized commodity software distributors are available. Unfortunately, to the best of my knowledge, no such organizations exist in Australia.

Orion Management of Chicago, Illinois, is one American company which provides

a complete range of software encompassing both trading systems and data management. Many of these trading systems are based on the writings of noted commodity traders, such as Wells Wilder Gann, as well as other individuals.

Cost in most cases is around \$US100. Recently, Orion has listed an advanced graphic charting package using a live cursor and the new Grappler interface card for fast printing of graphics pictures. Orion caters to the Apple II system. In a similar manner companies such as Management Services of Texas, has a range of software programs for the TRS-80 (I,II,III).

For a complete idea of the scope of software available, the reader is referred to a recent issue of Commodities.

Commodity Trading

For Australian investors who want to commit themselves to commodity trading in a major way (in terms of finance), membership of the Personal Technical Analysis Group, which supplies the Computrac system (available through Commodity Research, Sydney), may be the answer. This latter group boasts approximately 1000 members, with 40 in Australia.

For about \$1800 (membership fee) the member receives one of the most com-

prehensive and detailed software packages available on the market today. Furthermore, he is supplied with all updates and developments as they occur. The software package requires a special board be placed in slot 4 of the Apple, for the system to run. (Copying is therefore difficult).

The executive of the group is very progressive, holding regular seminars in the US as well as continually updating both software and hardware.

Features of the programs include extensive use of high resolution graphics, with split screen and zoom capabilities. A highlight is the use of the super chip designed by the group's development head, Dr. J. Schmidt (Professor, Computing Science, Loyola University), which allows the user to write over the face of the high-resolution screen with alpha and numerical information and perform numerous other tasks.

A major achievement of the group has been the general acceptance of its data-management system based on random access files. Most software houses now design their files to be compatible with Computrac, as Orion has done.

Exciting developments on the horizon by the group include use of two 64K RAM boards to reside in the back of the Apple and contain their own Dos 3.3. It is suggested their use will allow programs to be

accessed at hard disc speeds. Another item is a spooler, which buffers several screens of charts for the printer.

Combination of the two items has been suggested to increase operation speed by 350 percent.

Rigid Requirements

Time is obviously a primary consideration to a trader who has dozens of contracts to review. Unfortunately, the Computrac system is very rigid as to the hardware requirements of the member. These are Apple II/48K/dual discs/parallel interface/IDS PaperTiger printer.

It can be appreciated that whether you are interested in futures trading or not, the serious microcomputer owner cannot be totally oblivious to the developments occurring in this lucrative field.

A final word for those who after reading this article may feel they have found the golden goose. It is well established that approximately 85 to 90 percent of commodities traders lose — that is why the winners receive high returns. □

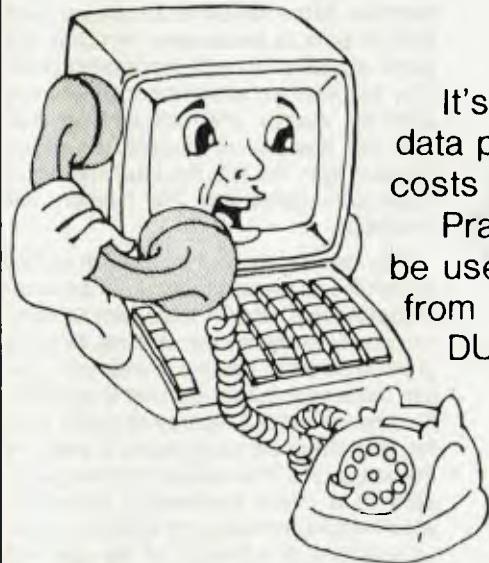
(In order to outline developments in this area, it was necessary to identify organizations and products by name. In no instance does this imply endorsement by the author; nor does it imply that the particular organization or product is necessarily the best available for that purpose).

CLOSE THE GAP

It's a fact that most data terminals are remote from the data processor. You can cut data entry delays, errors and costs by closing the gap with Sendata acoustic modems.

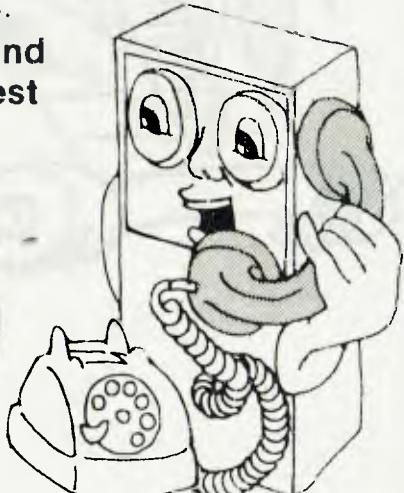
Practically all RS232 compatible data entry devices can be used via the standard telephone system at speeds from 300 BPS FULL DUPLEX to 1200 BPS HALF DUPLEX with Sendata modems.

Call us for further details and the number of your nearest Sendata stockist.



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One of the first local buyers of the Lazy Writer word processor was VICTOR FORSTMANN. He lashed it into a TRS-80 and put it straight to work. After four weeks processing, Victor, and his secretary, reckon it's...

THE LAZY WAY OUT



LAZY WRITER, written by David Welsh, is by a huge margin the best TRS-80 word processor I have used. It leaves Electric Pencil, Scripsit and Electric Secretary far behind.

Mind you, the first two are quite satisfactory word processors and Electric Pencil has been run on my office TRS-80 for the last 18 months with good results. My 20-year-old secretary, who uses it for all sorts of specialised projects as well as for typing letters, relied on it heavily and didn't think it could be bettered. She has now changed her mind after only one week with Lazy Writer.

Lazy Writer does not require additional switches, or control key conversions with messy labels stuck on, nor does it require multiple key pressing gymnastics. Just relax, load it in your TRS-80 and start typing. It is supplied on a TRS-DOS disk, but for greater efficiency, I copied the program to a NEWDOS/80 disk before trying it out.

Lazy Writer has two operating modes: Test Entry and Edit; you switch from one to the other with a flick of the Break key. Just type your purple prose in the Text Entry mode and you'll have your first surprise. At the bottom of the screen you'll find all sorts of information, which in the good old days of word processors could only be obtained after laborious and eye straining counts and calculations. You now see spelled out in detail the cursor position from the left, the total number of characters typed and the memory still available.

You can delete and insert with shift/d and shift/i and your headings can be automatically centred with a few simple commands. To enter key words in capitals you press shift/clear, instead of shift/lock; you can move your cursor from left to right with the arrows without destroying typed matter, and indenting paragraphs is easy. At this stage, you'll have used facilities available in a 'word processing typewriter' which would normally cost \$3000 or more. Lazy Writer, at a fraction of the cost, will make your text look so professional even an untrained typist like me can bang out a story effortlessly, without errors in the final copy.

Lazy Writer has much more to offer than the \$3000-plus 'typewriter word processors' and in Edit mode, the miracles really start to happen. You use this mode for Tab setting and for more extensive alterations.

The shift/i and shift/d commands used in Text Entry for inserting and deleting are now simplified to just pressing "i" or "d". Pressing Enter makes your changes permanent; pressing Break, before Enter, cancels them.

You can move your cursor all over the screen with the arrows, both backwards and forwards. You can skip words, sentences and paragraphs with the space bar or "w", the full stop and by pressing "p" (don't do this in Text Entry). Pressing "d" and then the space bar will get rid of words, sentences, or paragraphs and by using different keys you can also delete the entire text.

Positioning the cursor on a letter and pressing "c" will change it from lower to upper case or vice versa and pressing "C" will capitalise all first letters of a sentence and turn every free standing "i" into "I".

You can scroll up and down, a line at a time, with the vertical arrows, or by the screen, by pressing "a" or "Z". Pressing "z" will scroll the next line down, one screen at a time. Lazy Writer makes my printer, the Epson MX-80, underline words, print characters in a normal face, narrow face, double width face or double density. You can make the cursor search and find a particular character, word or phrase and if you wish, you can delete or replace these by other copy once or as many times as required. If you are in a moving mood, by waving a magic wand and pressing a few keys you can shift whole blocks of copy from one end of the text to the other.

Know Your Grammar

Lazy Writer has a very handy device which allows you to change the normal line width to a narrower column, and then it really excels by allowing words to be hyphenated almost automatically. Place the cursor on the line just below one of those nasty looking short lines that spoil the look of narrow copy, press "=" and the cursor will jump to the last place that can be hyphenated. Don't show your ignorance by pressing "-" there and then; you still have to know your grammar and choose the right spot to break the word, obviously in front of the cursor not behind it. If you still don't like the look of your copy, by all means press "d" followed by "=" . As I said, it's like magic — all the hyphens have vanished. You can start again and experiment with different column widths.

again and experiment with different column widths.

Saving and loading text, from any cursor position, demands the terrific effort of pressing "s" and "l"; with the bonus safeguard that after saving, you can actually see and check what went on disk by pressing "L". What's more, it does not destroy the last 90 minutes' effort of entering spell-binding copy; if you return to Edit, you'll find it still there. It's almost impossible to lose your text, unless of course you turn your computer off, then even Mandrake, the magician, can't help.

But if you get bored with typing, you can have a look at the Directory or go to DOS to do some clever things. You may want to kill an old file to make space for a new one, but on return to Edit, you'll find that Lazy Writer did not let you down.

If you have accidentally pressed the wrong keys and the screen blacks out, (mine is more professional, it's green), this magic word processor has a further trick up its sleeve. Rescue/cmd is an extension which can be called from Edit. It will resurrect just about anything. However don't expect to be rescued if one of the clever things you did earlier meant going to BASIC, then you're in deep trouble and you've really lost your text irrevocably.

Sending your text to the printer is done by calling a comprehensive printer menu, which lists a range of default values you may be able to use these as they are, although I certainly had to change them for my purposes. It shows the usual margin, width and depth but it also allows you to make your changes permanent and you can print your printer commands for record purposes.

A Little 'Help!'

A nifty device which makes Lazy Writer worth every cent you spent is Help. Press "h" and it will rush to your aid quicker than an ambulance driven by Peter Brock. Help is a list of brief notes on the most commonly needed editing features. You can add to them and you can save the modified file under the name Help for future use. I have added and changed my Help file considerably, but then my memory deteriorates later in the afternoon when I need all the help I can get.

Multi Function Keys allow the user to define any one of 10 keys. I do not find this facility of much use in ordinary typing, but

for the insertion of frequently used expressions in specialised typing jobs it proved to be time saving. For programmers it will prove a boon: Who likes typing PRINT, LPRINT, INPUT, and GOSUB 100 times or more, when it's so much easier just to press a couple of keys, and presto.

I entered a BASIC program consisting of 279 lines in Lazy Writer with my customary large number of typing errors. It would have taken days to edit the program in BASIC, but in Lazy Writer, it took less than half a day.

According to the manual, Scripsit and Pencil files will load into and be usable in Lazy Writer, without too many modifications. I've had no time as yet to test this claim. I hope it works.

A word of caution — don't expect to master all of Lazy Writer's devices and extensions in a week. My secretary learned to operate the processor's simpler facilities in that period and this is satisfactory for general office use. To understand and make full use of all it has to offer will take much more time. For instance, there are a few more extensions and there is much more to say about the ones already discussed, but space is limited.

My advance copy of Lazy Writer contained a few bugs, most of which I learned to overcome and others I just ignored. Some of the instructions I found confusing and insufficiently detailed. If the instructions had been more clearly explained, I would not have wasted time on trial and error experiments. This should not be too disturbing. I have been told that the improved version, soon to be released in Australia, has had all the bugs and other problems corrected.

To sum up, Lazy Writer is an exciting and impressive newcomer to the competitive market of word processors. It does what other processors do, but better and in some cases faster. It has far more potential than either Scripsit or Pencil and it offers many more useful and interesting extensions.

As I said earlier, except for stupid mistakes, it is all but impossible to crash the program. The manual, in spite of the instructions criticised above, is clearly and concisely written. Lazy Writer is the best TRS-80 word processor I have used and for the price, it must be the best buy of the year. □



Chips Solve Toy Distribution Problems

Credited with near Papal infallibility, Santa Claus still shudders with embarrassment when he remembers that unfortunate Christmas night his blithering reindeer mistook a certain outbuilding for the Schmitt house.

To eliminate the possibility of any such error in future, Mr Claus has enlisted the aid of a micro-computer. Case History investigator FRED SYMES, ever on the track of a good story, has just filed this report from the North Pole.

NORTH POLE. — December 24: Gale force winds and driving snow are battering hard against the walls of the world's most famous toy factory, which stands gaunt and alone in this inhospitable wasteland, shared occasionally by polar bears and American and Russian submariners.

Inside, a thousand pairs of tiny agile hands work feverishly away, packing the final consignments of toys for all the good boys and girls of the world. Time to complete the gargantuan task is quickly running out as master toymaker, Mr S. Claus, prepares to embark on a delivery run which would daunt the most diligent TNT courier.

Even I have gladly lent a helping hand with the packing. Let's face it, it's the only way to keep lukely warm in this icy palace of juvenile delight.

I asked Mr Claus ("Just call me Santa") why he had chosen such a forbidding site for his factory.

This ultimate in father figures replied: "Well, son, if I'd built it in a more accessible location, all those little bra...ah, children would knock the stuff off as soon as it was made. You can't trust anyone these days."

Over a warming cup of herbal tea, Santa and I chatted about the problems of running his business, and how he'd been able to increase efficiency by installing a micro-computer.

Had it meant a reduction in staff? I asked him, knowing how concerned employee organisations are about job insecurity in this technological age.

"Not at all, son," he said. "Actually, the contrary is the case. You see, we're so

isolated here we don't have the electricity connected. So I've had to employ a horde of gnomes to operate the treadmill generator we've set up to drive the computer. Then, too, I've had to employ a few whips to make sure the little beggars don't slack on the job."

It was essential, he added, that the gnomes maintain a steady speed on the treadmill, to eliminate the possibility of power surge. Of course, continued the grand old man of happiness, there was the occasional laggard in the workforce, and mistakes did creep in.

This resulted in the odd child receiving a gift they did not want.

"Please make it clear in your story I'm not to blame. The fault lies with some lazy little sod on the treadmill," Santa said sternly.

I asked Santa why he had decided to install the micro.

The Bondi Tram

"It was like this, boy. There was that terrible error of judgement — the Schmitt house you may recall — which caused me no end of embarrassment. The story spread around the world faster than a Bondi Tram, as you Australians say. (Santa really is quite old).

"For quite a while I was the laughing stock of my competitors at Tonka, Meccano and Matchbox. Oh, you should have heard some of the nasty jibes."

Santa's wooly beard trembled with emotion as he recalled those days of shame.

Choosing a micro was not easy. He tried to contact Dick Smith, but he was too busy. Apparently Dick was towing an iceberg up Sydney Harbour at the time. I didn't have the heart to tell Santa that that was on April 1.

He looked at a Commodore PET, but decided against one of those because of the need for Santa not to be seen to have any favourites. After much searching and indecision, he purchased a NorthStar Horizon.

"It seemed to have a familiar ring about its name," Santa grinned.

Naturally, the first program to be formulated put into logical order all the addresses to which Santa had to deliver gifts. Such information as chimney sizes was included, to show up any which might cause discomfort to Santa. Access to the

growing number of homes without chimneys was also included in the program, thus eliminating time wasted searching for unlocked doors and windows.

"This latter problem was becoming so serious," said Santa, "that there was a growing danger of deliveries being extended over several days. And I don't think that would have endeared me to those kiddies receiving gifts before or after Christmas morning.

"Thanks to my NorthStar, this is no longer a problem," beamed Santa.

Micro Proves Invaluable

Stock control is another area in which the micro has proved invaluable.

Early next year Santa is joining The Source, which has agreed to act as a clearing house for toy requests from children all round the world. The Source will automatically sort the requests into toy categories.

Each day Santa will log this information onto memory, from which he will get a printout of requirements. This will be passed on to his factory supervisors.

At the same time this information, plus addresses, will be transferred to his delivery schedule program. This, in turn, will be updated each Friday.

On December 24, 1982, Santa will receive a final printout of his delivery route, with all relevant information needed to speed up the job.

"The microcomputer has been a Godsend to me. Without it I'm afraid I'd have had to seriously consider tossing in the towel, or hanging up my hammer. It was all getting just a bit too much. I'm no longer a young man, you know."

"Certainly I would have had to cancel all my pre-Christmas promotional appearances in the department stores," said Santa.

"Now, thanks to the NorthStar Horizon, the children of the world can rest easy. Like Macarthur, I will be back," said a determined Santa.

With that, the old man eased his giant frame up from the stool and went off to give his reindeer an encouraging pat, before dashing off into the night.

To all my readers (hi, there, Mum) may I echo the last words of Santa as he disappeared among the stars: "Merry Christmas." □



The one-stop Microcomputer Shop for total service to TRS-80* users

*TRS-80 is a registered Trademark of Tandy Radio-Shack

CISA

Now accepting
orders for MOD III
version

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**David
Welsh**

MOD I - \$125
MOD III - \$175

*Requires 2 drives for
conversion only.



It is time to put your
word processing program
away and use a
Word Processing System

Lazy Writer is the product of ABC Sales

An innovative
word
processing
system
for
TRS-80*
MOD I
&
MOD III

LAZY WRITER Takes on Scripsit® by Radio Shack® and Electric Pencil®

Has all the things that other word processing programs should have. Easy to use, written all in machine code / It permits the inserting and deleting by characters, words, sentences, and paragraphs / Page scrolling up and down / Search ahead of the cursor or behind the cursor for any character / The cursor can be moved up, down, left and right / You can seek top of file and bottom of file / Block move of text, block delete of text / Search and replace or search delete / Unlimited insert (to the limit of your machines memory) / Permits use with lower case /

Has things that other programs should have, but don't. Upper and lower case output to your printer (if your printer accepts lower case) without having your computer modified. ON UPPER CASE ONLY MACHINES This program marks the capital letters so you can see which letters are CAPITALS and which are not. / Will change all upper characters text to lower case or all lower case to upper. A SINGLE COMMAND / Will capitalize the first letter of all sentences and all proper noun's. WITH A SINGLE COMMAND / LOADS ANY ELECTRIC PENCIL / FILE, ASCII SAVED FILES, EDTASM FILES or BASIC PROGRAMS SAVED ASCII / Permits installing special control characters in your text for your printers special features, like double wide or condensed print / Definable screen length and definable print length to 255 characters wide / Screen editing that is not final till you command. This means that you can edit your file on the screen and if you don't like how it reads you can cancel and leave it the way it was / You can append files (which means that you can put one file to the end of another file) / No lost characters at the end of the line, even for the fastest typist / A directory of all your files is available to the user without leaving the program / Saving programs to disk easy enough for the non-computer user / To save memory, not all the program modules are in memory at one time but are called from the disk as needed / You can set tab positions like on a typewriter / 10 CUSTOM COMMAND KEYS for the experienced user there is a command file that permits many special functions that are all user defined (not enough space for better explanation in ad. send for complete overview) / Program has HELP file that is a short review of the commands that are available /

Standard Printer Module. This printer module is provided for the user as a standard feature. Optional special printer routines for custom printer will be available in the near future. In this original release, it has the following printer drivers and will support the following printing devices: RS232, TRS232 and PARALLEL printer ports. You have the following format commands. Justifies Text, Centers Text, Centers Title, Line Spacing, Line Length from 3-255 characters and Set Margins / Also send any ASCII code to any printer from the text / Save formatted text to the disk for spooling later / Information for customer to load his own special printer driver / Printing can be stopped and started by the user at any time and then restarted where you left off / You can print entire file or just print to bottom of the page /

Communication Package. RS232 COMMUNICATION TERMINAL PROGRAM permits you to communicate with other computers. Transfer files from one machine to another. Permits dumping memory across the phone lines. Receive files from other TRS-80's and "Shake Hands" with larger computers. This is the complete system called LAZY WRITER. There is no package written for the TRS-80* that is as comprehensive. This package is available for the TRS-80* MOD I, 32K or larger with at least a single disk drive. List price is from

\$125.00

Dealer Inquiries Invited

CISA

89 YORK ST. SYDNEY.
Ph. (02)291 599.

NEW FEATURES in Lazy Writer

"The People Request, and David Welsh Delivers"

The system permits embedding ASCII commands into the text of the program. NOW you can do SUPERSCRIPT and SUBSCRIPT (if your printer can handle it). Underlining and boldface, printing of a single word in a paragraph, is now possible, at no extra cost.

A key that remembers the cursor position.

User definable special character. For use with printers that have printable characters that the TRS-80 keyboard does not normally support.

Margin control from within text. This means that you can change the margins of your printed text without stopping the printer routine and changing it.

Page offset with odd/even headers and footers. This means that you can print one page offset to the left of centre and the next page offset to the right. This is very nice when you are writing a book.

Printing chaining feature. This permits having more than one file on disk and create one printed letter, contract, or book without having to reset the printer commands.

Mandatory space command. This is necessary when you are writing letters or papers that have certain words that are not to be broken-up. e.g. John P. Androussier. This name can be made to be unbreakable to justify routines in the program.

Disk catalog. Now you can load your disk directory into memory and create a file of this information.

Reverse Indents or known as Hanging Indents.

WHEN YOU'RE THROUGH PLAYING GAMES.

Professional Upgrade

Many owners of Tandy disk based systems have experienced a great deal of difficulty when trying to use the system in a business environment. There are many symptoms of this: Inexplicable re-boots, the dreaded "silent death", disk I/O errors, glitched disks and other problems which we have all experienced at some time. Fortunately the TRS-80 never suffers from terminal illness and can always be cured. We now offer a service, which we call the CISA PROFESSIONAL UPGRADE, to TRS-80 disk based systems, which can truly make the system sufficiently reliable for consistent and heavy business use. To undertake this service, we need your whole equipment, excluding video. The only visible change is the replacement of the existing edge connectors with heavy gold plated self-locking connectors between the keyboard and the interface. Every component (yes, we mean EVERY) is checked for reliability and performance to design specification. Several modifications are done in the interface depending on the serial board number and type. Disk drives are tested for speed and alignment, and if realignment is required you will be informed as this is a significant extra cost. We have already undertaken many of these professional upgrades for many highly satisfied business users throughout NSW and the Sydney metropolitan area.

The minimum fee for this service is \$250, but where we find that a number of repairs and modifications have to be undertaken (for example replacing an unreliable Z80 chip or 1771 disk controller), you will be informed of the additional cost. This service includes the CISA DISK DATA SEPARATOR and VIDEO STABILISER CRYSTAL, if not already fitted. We strongly recommend that a green screen be fitted, if you do not already have one, as this then gives your equipment the performance and appearance of a professional computer costing many thousands of dollars more. Please phone for more details of this service if you think it could be of assistance in your application.

INTRODUCING CISA PROFESSIONAL & PROGRAMMING SERVICE

For some time now we have been looking after a group of business and professional users of the TRS-80, offering a programming and systems analysis service to tailor both existing and new software to their specific needs.

We are now in a position to expand this service to a few selected clients in the Sydney City area.

If you think a company with a personnel who have collectively over a century of programming and analysis experience could be of use to you please phone us to discuss this service.

Site calls are undertaken on a fee for service basis.



HARDWARE AND REPAIRS

Hardware Lower Case Kit for TRS-80/System 80

Don't be fooled. This a full hardware implementation, not a shoddy little patch. No... Repeat... No software program to drive it

True descenders on lower case.

This circuitry is identical to that used on mini and mainframe terminals.

Very easy to install.

Does not interfere with any known software package.

Uses none of your precious memory.

\$80 Kit; \$100 Installed.

48K IN KEYBOARD KIT

Often imitated never bettered

BEWARE! There are many cheap imitations of this CISA innovation. Many badly designed kits will put unacceptable drain on your power supply and it can become a dangerous fire hazard!

Our implementation was many months in development and has been carefully designed to operate well within the design limitations at the power supply.

Again, this kit does not interfere with any software, and it is totally compatible with all CISA developments and modifications.

Kit \$179; Fitted \$199.

100% SPEED UP KIT FOR TRS-80

This design employs advanced circuitry and automatically switches to normal speed on cassette and disk I/O.

It is designed to 'wake up' in high speed, and if for any reason you wish to operate in normal speed, it is software-switched from BASIC.

No external switches provided or required. Does not interfere with any other CISA modification or development, and is an absolute must for serious business application. Computer chess freaks will find this modification invaluable.

Like all CISA developments, this is a product of serious design and research work and not a shoddy bunch of chips thrown together in a tin shed.

(Note the kit will NOT fit into the System-80 under any circumstances. System-80 circuitry is just not capable of operating reliably with the higher speed.) \$180 fitted.

CISA DATA SEPARATOR VERSION 4

This totally new version of the Data Separator will fit ALL Tandy Model 1 interfaces. No cuts on the PC board and no wires to solder.

Simply remove the disk controller chip, plug in this beautifully designed PC board, and replace the controller chip.

Unlike any other Data Separator kit on the market, this version will totally remove any disk I/O error, tracks locked out, CRC error and data lost during read/write errors, which so many of you have learned to live with.

PROVIDED You have a good quality diskette, well aligned and adjusted disk drives, and a good quality line filter, WE GUARANTEE YOU WILL HAVE A MASSIVE REDUCTION IN DISK I/O ERRORS.

Kit \$37.50; Fitted \$57.50

CISA REPAIR AND SERVICE CENTRE

Just to remind you our repair centre can now undertake any repair service alignment, adjustment etc to any TRS-80 or related microcomputer or related peripherals. In most cases we have four day turn around.

Bring or send your faulty equipment to 89 Your St, City Showroom. Out of town clients, please phone to arrange cartage, etc.

We repair machines where others have failed. A full 90-day Guarantee on all replaced parts and workmanship.

A New CISA Service

CISA will now undertake site repair work in Sydney City area on TRS-80 and related equipment.



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SYSTEM + II (2MB +)

Computer System with 8" Dual Sided Drives (uses Y-E DATA YD174 Disk Drives) Terminal not included.

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EDUCATION COMPUTERS

Computers are becoming an increasing useful tool for educators, allowing them to broaden the interest and work-span of students, and providing part of the answer to problems in teaching retarded, handicapped and even slow learning children. Computers are also of assistance to the education researchers, in formulating new curriculum structures. DR. JOHN BARRETT, Lecturer in Education at Macquarie University, has been studying computers in education both in Australia and the United States.

MANY ARTICLES appearing under the heading of computer applications in education only cover instructional aspects, and even then few go beyond Computer Assisted Instruction (CAI).

It is thus probably worthwhile to attempt to review the full range of applications in the many facets of education.

The field of education is broad. However, I have restricted myself to those activities carried out in formal institutions (private or public), in schools or post-school areas — technical and further education, colleges of advanced education and universities.

Many of the applications discussed are well established in schools and colleges in the United States — particularly in the school districts of California. A disappointment is that systems which were fully operational in the US some ten years ago will still not be encountered in the Australian Educational scene. But the aim of this article is not to show what others have done with computers in education, but to encourage readers to think of the many ways that microcomputers can be applied to educational problems.

We should be encouraged, for what was space age and expensive only a few years ago is now economically viable and practically possible.

Computer applications in education can be considered under a number of headings:

- Administration — largely concerned with the business side of the enterprise.
- Research and reporting — covering aspects of gathering, sorting and presenting information.
- Computer Knowledge — including the

teaching of Computer Science, as well as computer awareness and literacy.

- Information Systems — the provision of special forms of educational information, including library systems and guidance systems.
- Learning purposes — embracing those application where computers are employed to establish a relatively permanent change in behaviour; be it intellectual (knowledge), emotional (attitudes/values), or in physical performance (manipulative skills).

Of course there is some overlap and inter-relationships between categories, but these groupings have proved useful in sorting out the many and varied activities in such a diverse undertaking as education.

Businesslike Thinking

We tend not to consider the school as a large business organisation, although this becomes more obviously so at the college or university level.

At a national meeting of business, industrial and educational leaders in the US, participants were asked to introduce themselves by describing the organisation they represented. One person described his company of many thousands of employees, huge numbers of regular customers and a multi-million dollar budget.

The other participants waited in puzzlement. What large and significant firm did he represent? Laughter and surprise abounded when a strong Bronx accent announced that he was the superintendent of a New York school district!

Applications of computers in the administrative area cover all management functions, including accounting and payroll systems. In fact in school districts in the US and in universities and colleges in Australia this represents a large proportion of the use of computers in education, says Waring's *Computers and Teaching in Australia* (1975).

More specifically, educational functions include timetabling and other planning strategies. For example, decisions may be made about the introduction of a special education program, based on an analysis of information regarding students performances, available teacher resources, current funds and time and room availability.

Management extends to all forms of stock control. For example, the ordering and monitoring of library books and textbooks can be computerised. Programs for the distribution of textbooks may be readily arranged. Other administrative applica-

tions may relate to simple but time consuming activities in the school environment.

The ability to locate a student at any time of day is an example of a simple but vexing problem in schools. Certainly such activity can be carried out without technological support.

At one school we had two shoe boxes of cards — one box held 1200 pupil timetables; the other had class and room allocations for each period of the week. You can imagine how much time and effort was required to establish and maintain this Julius Marlow Management Information System.

Class list, timetabling and location lists of staff and pupils is an ideal area for computer application.

Computer Enrolment

Another major area of concern in education is enrolment for courses and programs. Two aspects need mention here — pre-enrolment and actual enrolment. Both processes may be carried out in a group or individual mode.

The most common form of enrolment in schools and tertiary institutions is to have (or try to have) a large number of people enrol within a set period of time. This involves the usual queuing problem, with periods of slack and periods of overload, both of unpredictable duration. The cost and waste of resources is phenomenal!

At Macquarie University we carry out this process over a span of about two weeks per year, by hand, although we do have some support in the form of computer generated transcripts of previous courses and grades. However, the irony is this labour intensive activity is conducted adjacent to the computer centre.

Pre-enrolment enables data to be gathered and analysed for planning purposes — especially the allocation of resources. This process may be accomplished on data sheets, which can be transferred to punch cards, or more simply on forms for optical scanning.

A device known as the Quest Micropad (from Micropad of Prahan, Victoria), which enables handwritten data to be translated directly into machine readable form and entered immediately in a computer (mainframe, mini or micro), should prove an invaluable aid to educators and administrators. Although there are a number of discrepancies between pre-enrolment and actual enrolment, even these lend themselves to monitoring and analysis, and can be built-in to predictive equations concerning student numbers in courses.

Mass Production

Of course enrolment is a simple process of confirmation or in most cases, making minor changes, excluding large scale mass-production methods still used in many institutions. At least one humanistic advantage is that this procedure frees staff to get on with the more important and professional task of advising and counselling.

A good example of an efficient enrollment system is to be seen at Columbus Technical Institute (Columbus, Ohio). The front office resembles an airline terminal, in that it is possible at any time to check the status of any of the 30 two-year programs of study offered by the college. One may find, for example, that Aviation Theory is still open, with three seats remaining, its meeting place and time, number of credit points and the name of the instructor.

It is obvious that microcomputers can provide all kinds of support services for the management and administration of educational institutions. The big advantage of micros over large mainframes is that their cost and usability make them suitable for local operations with small numbers of staff or students.

While they do have the potential for enabling the teacher to concentrate on professional aspects of the enterprise, one problem will remain for some time: who will develop the required software? Will such development be carried out by education departments, school administrators or a 'volunteer' from the mathematics department?

It may be better to set up a special research and development institute to concentrate on educational software. The problem of appropriate software is probably the major obstacle preventing the widespread employment of computers in educational administration.

The Research Division

A second area where computers can play a significant role in education is in data analysis for the purpose of research and reporting. In regard to research, it is obvious that computers (of all forms and sizes) have played a substantial and significant role in the analysis of research data.

This is particularly true of research conducted in universities by staff and candidates for higher degrees. However, the place of computers in research divisions of state education departments, departments of technical and further education and in various colleges of advanced education should not be underestimated.

As the availability of microcomputers becomes greater and more friendly software is developed (including author programs), we may hope for more research to be carried out by those actively engaged in the teaching process. Teachers need to

be encouraged to question the teaching process, and the effectiveness of their own teaching. With some assistance, teaching staff could carry out some true experimental designs, as well as developing analysis and monitoring techniques of, say, student performances, over periods of time.

Another aspect is the provision of various kinds of reports generated from banks of educational data. Such reports may be at the larger systems level, of the kind providing educational statistics of a descriptive nature.

Any school principal will be willing to elaborate on the range and diversity of statistical reports required each year: attendance patterns, staff movements, budget reporting, cost of maintenance and repairs and a whole range of reports on special funds, for such things as a Fodder Allowance for the horses of children attending country schools.

One area of commonality between research and reporting function is that of Standardised Testing. These are large scale testing programs, such as ability tests (IQ). Tests of this nature can be marked (and set) on computer, with the results generating many types of reports.

Analysis and evaluation can also be conducted and reported from these data.

The gathering and dissemination of subject grades to pupils is a fairly simple affair for a computer-based system: naturally, this comment does not apply to the actual marking of essays. In fact, one school district in California boasted a turnaround time of two days, from the student sitting for tests to receipt of the results in the home letter box.

Computer Knowledge

Computer knowledge has two components. First is that of knowledge acquisition, known as Computer Science. It includes specially designated courses, mostly (also, unfortunately) in post-secondary institutions in Australia.

These courses provide a thorough grounding of professional competence — knowledge and problem solving skills and such — for a career in computing. Courses of this nature include computer programming, system analysis and hardware architecture.

Probably the most representative of a specialised program of study is the Bachelor of Applied Science (Computing) degree, available at the New South Wales Institute of Technology. Similar courses are offered at colleges and universities. Also, TAFE offers a number of computing courses as part of diploma programs in business or engineering.

The second division within the area of computer knowledge is concerned with increasing of computer awareness. It's quickly becoming known as computer literacy. The goal of computer literacy

courses is to disseminate information to help people understand about the uses of computers in society, to develop some fundamental computer skills, and to develop an awareness of social issues involved in the use of computers in society.

Apart from the Direct Instruction Computing model (see *Computers Don't Byte* by Maggs/Ray/Webster), it is difficult to find a coherent statement of philosophy, a clear indication of the topics to be covered, or the practical skills participants are to achieve to successfully complete a computer literacy course. Some descriptions refer only to a graduate's ability in programming (probably in BASIC language, but no minimal level of competence is given).

However, such attempts to introduce all pupils in schools and post-secondary educational institutions to the world of computing is most encouraging, for to be educated in today's society means that one must have some knowledge of what computers can and can not do. It means to have some programming and manipulation skills. But above all, it means to have developed a value system encompassing computers and computing, which may lead to responsible decision making about their role in society.

The computer literacy field is an area which will require continual dialogue between those in the computing and mathematical fields, those in the social sciences, and those responsible for curriculum formation and development of computer literacy courses. The whole area of computer literacy, its purpose, the structure of an appropriate curriculum for all levels of education, and the implications for the training of teachers, warrants a separate review.

Information Systems

The ability to access information is vital to the educational process. This aspect may be examined under three headings.

The first is **Library Information Systems**: large data bases covering accumulated knowledge and recent research findings are an essential part of the information resources teachers and lecturers require for instructional preparation and further research.

The Educational Resources Information Clearinghouse (ERIC) is the most relevant Information system in the educational field. A number of specialised clearinghouses (in the USA) review and index materials in appropriate subject categories. For example, Educational Administration comes out of the University of Oregon, while Vocational and Adult Education goes into the system at Ohio State University. Access to the data-base is made by using a number of key words or ERIC Descriptors. The process may be Batch or on-line.

The on-line format allows an interactive search where a user can keep tabs of the direction of the search and monitor the number and appropriateness of available references. When satisfied with the search, 'hard copy' of an abstract of each reference may be obtained.

It is interesting to note that the costs of a search have reduced dramatically. A search that cost \$US50-100 about ten years ago is now available to Ohio State students for \$2 to \$5!

An Australian version of the system is being developed. It will become part of not only the educational scene, but also will be found in local libraries and eventually be accessed from any home terminal.

As information systems **Career Guidance Systems**, often called Computer Assisted Counselling (CAC) systems, are more accurately Computer-Based Guidance (CBG) systems.

These CBG systems allow interactive exploration of data about careers: descriptions of jobs, qualifications required and related education and training programs available, and information about predicted prospects in an occupation. These systems allow exploration and analysis of possible career decisions.

In some cases one's academic record is compared with a selected occupation and feedback is provided about the ap-

propriateness of the decision. This is done in a positive way. The student is not told that he could never do a particular job, but is informed of what he should do from here on to have a chance at entering a career field.

An attempt has been made to tie such exploration and guidance systems with current data of job availability for different occupations and different geographical localities. Some other systems provide a referral service to various firms or individuals who volunteer to provide on-the-job vocational information.

As for **General Information**, it is particularly important that many lecturers and researchers in tertiary education have easy access to a variety of up-to-date information. One college in the United States has provided all staff with microcomputers and access to the MIDAS data-base. How long before this will occur in Australia?

Learning vs Teaching

The term learning is appropriate, rather than teaching or instruction, to emphasise that this category is more concerned with what a student can do rather than what a teacher, or a computer, does. Learning encompasses a student's increased ability to perform some task.

Better performance may result from improvement in being able to co-ordinate

physical movements, make fine manipulations (as one does in typewriting), by increasing one's knowledge of fact, the ability to process information (intellectual skills), or by changing an attitude towards performance in a specific situation.

Patrick Suppes of Stanford University, one of the early leaders in the field of computer uses in education, saw computers contributing in three ways: **drill and practice** — the attainment and repetition of basic facts and skills; the **tutorial mode** — the provision of higher level problem solving with monitoring of progress and differential assignment of remedial of more demanding work; and **simulation** problem-solving on close replicas of reality.

In this review it is not possible to make a critical appraisal of the state-of-the-art in the learning/instruction area, although a few comments are called for.

Many of the available programs, however 'pretty', are in the lower order drill and practice mode, based on principles derived from Behavioural Theory and the early work of B.F. Skinner and the teaching machine era.

These programs are quite suitable for the acquisition of facts — naming state capitals, being able to label parts, knowing mathematical tables, spelling — all of which are important. But few, if any, pro-

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rams reflect progress made in Cognitive Theory (information acquisition, storage, processing and retrieval by the brain) or Cognitive Developmental Theory (development of thinking capacity and processes).

In Simulation Mode

Simulation is a significant mode of learning which has not been given its due emphasis in education. There are three aspects which have an important role to play in the learning process:

Model Building — The gathering of data to build a map of the pattern of relationships between variables. On computer, substitutions may be made to give different weight to different factors producing the best representation of reality.

Simulation — If one actively interacts with a model of reality, then the decision making/problem solving processes or physical activity can be simulated. Experiences in industry and the armed services have shown this to be a viable and relatively inexpensive form of instruction. The large Plato System (from Control Data, Australia) has some excellent flight training simulations on computer, which include the turning of controls on the instrument panel (through a touch-sensitive dis-

play screen).

There is a great deal of room for imagination and effort to marry the convenience of the microcomputer with well conceptualised and well constructed software simulation packages.

Education games — First a simple definition: a game is an activity, or contest, in which there are potential winners and losers. This simple definition helps to emphasize the ideal that 'game', in an educational sense, contrasts with the idea of 'game' as synonymous with entertainment, and having no serious goal in terms of academic performance.

There is nothing wrong with fun games, but it should be acknowledged that here learning as a very incidental by-product. In educational settings, contests between individuals, between teams, or between an individual and the computer have a potentially valuable place. Indeed, one of their important features is that they provide interest and motivation. We only have to keep in mind that such activity should be purposeful leading towards some educationally worthwhile goal.

Simulation Game — The combination of a simulation and a competitive activity is an exciting and appropriate function for a computer to perform. This is an applica-

tion crying out for development. Why not have students develop their own simulation game from data about real problems?

Computer Managed Instruction

An additional and important function the computer can perform in the classroom is the management of the learning environment.

Briefly, Computer Managed Instruction (CMI) is a support system for teaching/learning process and includes:

The management of curriculum resources; assignment of students to various classroom activities; record keeping and activity assignment (usually to other computer-based lessons) for individuals; summaries of data from classroom assessment programs, including test scores and records of test students have completed; and management of other audio-visual equipment, that is control of tape-slide presentations.

A recent example described by David Crouse, in his paper in Educational Technology, of a computerized grade book should trigger a host of ideas of how computer power can "free a school's professional staff of burdensome paperwork" as he puts it. □

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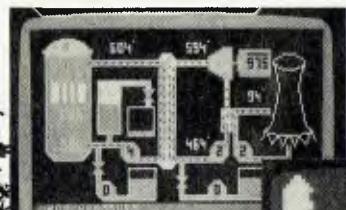
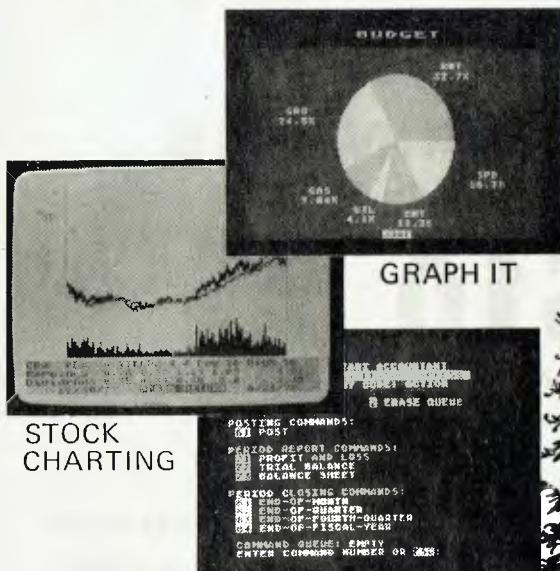
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PROGRAM PIRATES

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***** WARNING ***** WARNING ***** WARNING *****

COPYING COMPUTER software is not difficult and although it saves a lot of money it is illegal.

For many of the emerging computer retail outlets in Australia, the copying of programs is becoming a financial headache of migraine proportions.

Increasingly, retailers are finding that new programs imported from the US, Britain and Japan are being copied and distributed by bootleggers within days of their arrival in Australia.

Because the costs of landing pre-recorded programs, disks and cassettes has increased recently due to sales and import taxes imposed by the Federal Government, the program pirates and bootleggers are finding an active market for their copies.

For the Australian computer industry this means much of the software is no longer profitable and programs are rapidly disappearing from the retailers shelves.

Retailers and manufacturers angry about the rip-offs say they are being forced more and more into the hardware market because these systems are more difficult to copy.

For the user it means that an important input of technology is being eroded away.

Copying of material under copyright is not uncommon, most people for example have cassette tapes of their favourite album music recorded on their home stereo equipment. This of course is illegal and if you read the fine print on the album cover you will discover you can be sued for it.

Every student who has been diligent about his or her studies, has photocopied part or whole of books being used in research. This again is illegal as it is depriving the author of his or her rightful royalties gained when a book is sold over the counter.

And while many people disregard the copyright warning believing they could never be caught, let alone prosecuted, for copying material, they are running an increasing risk of being sued for very large amounts of money.

In the US, companies producing computer programs have begun taking legal action against computer user clubs which copy their programs.

In Australia, Eric Ackroyd, managing director of CISA Microcomputing Pty. Ltd., is on the warpath for the program pirates and he makes no bones about the fact that he will sue if he gets any evidence of people copying programs sold through his company.

He says the program pirates are costing the computer retail industry millions of dollars a year and they could eventually sound the death knell for many of the newly established dealers.

There are several US companies who are willing to pay a reward of \$10,000 to catch and successfully sue the pirates, Mr Ackroyd claims.

"I want the \$10,000 reward and I will take action against anyone I find copying the programs," he said.

Mr. Ackroyd says many Australian computer retail outlets are being crippled by

the copying exercises.

And he blames the computer clubs for much of the damage done. He says they are the worst offenders in the program copying racket.

"The systematic rip-off of software by computer clubs is destroying the Australian industry," he says. "Some of these games take up to five years to write but they are being copied and distributed within weeks of their release on the commercial market."

"The only way to stop it is to make a few public examples by suing some of the clubs or distributors — sue them and take their homes and businesses."

Mr Ackroyd admits he is very bitter about the program rip-offs as he explains his company had put \$35,000 into purchase and promotion of programs only to find that within weeks of putting them on sale they had been copied.

"We put every dollar we had into the programs and in no time flat, the programs had been copied — even though we had exclusive rights to them," he said.

"To survive we will have to concentrate our sales on hardware which can't be copied. We can no longer put so much money into software and this is what is happening throughout the Australian computer industry."

Mr Ackroyd said his company would be supporting the Lazywriter and: "If we find just one illegal copy we are going to sue and go after the person's house and business." □



LINTON-SIMPKINS

Chilling the Odd Beef

LET'S FACE it, the life of your average cow is not too exciting. What with artificial insemination taking most of the fun away, but leaving all the problems, and the realisation that one will probably get mixed up with a bad crowd and end up as a US hamburger, it's rough.

I mean, you complain about your consort having cold 'feet' in bed. Well those artificial insemination teams store their 'input' in liquid nitrogen, and you know where they have to put it.

Then there is the indignity of that gadget that uses a selection of scanners, a slew of analogue computers, and a mini to calculate how many kilograms of rump, blade, tripe you contain — and all in the time it takes you to walk up a ramp and across a bridge.

Cows, as a general rule, also have to sleep out at night in the middle of fields that other cows have been using for unspeakable purposes.

There used to be a US firm which advertised that its butter came from contented cows, but few cows can really be contented these days. As if artificial insemination and scanners and calculations of the most personal details of one's life weren't enough, the US Department of Agriculture is now recording one's daily output of milk as one journeys through this vale of tears to one's final resting place on a sesame seed bun. And the final insult is being obscured by exhausted vegetables and haemoglobinish sauce, not to mention the vile beetroot.

If, as one wit put it, the US wasn't discovered but merely detected, we could still not claim to be any nicer about invading the privacy of herefords or breaching the confidences of otherwise friendly friesans. Years ago, I can recall writing a response to a request for tenders by the NSW Government of the day, and that this response required one to provide a

system of lactation counting for the NSW dairy herds.

It also required one to write a system to "calculate the misclose by the method of double longitudes." Or maybe it was "double latitudes".

But that doesn't matter, because I never could remember which was which and the misclose was as big a mystery to me as the lactation count, so I failed to gain the order. Now lactation counts are an everyday factor in my life, and I have missed so many closures that I have become blasé.

Now, before the entire dairy industry and the seven or eight governments which grace this suffering continent crawl all over me with running spikes on, I know what I am about to write is a common practice in Australia. But since my countrymen, particularly those who punch and otherwise mistreat cows, sadly lack a sense of humour, I'll write about the alien Yanks.

Animal Improvements

The Animal Improvement Program Laboratory, near Washington DC, keeps detailed records on its IBM computer of the milk yields of all the dairy herds in the US. By matching genetically superior cows with good bulls, with the aid of the Department of Agriculture's computer, the herd owners can breed cows that will give increased yields.

According to the Americans — and who after Watergate, the Ellsberg disclosures, and non-operative statements can seriously doubt anything they say — the lactation counting and its associated breeding program has kept US milk production at the annual 545,454,545 kilograms it was in about 1950, with only about half the number of cows now as there were then.

It's all rather sad really. Now the poor cows not only never meet the bulls who provide them with offspring, but have their proxy mates picked for them by a distant computer.

It might work better this way for humans, too, although I wouldn't have thought that lactation counting would be the optimum way of selecting human breeding stock.

Oh, I don't know though; the genes of that lady who managed to produce four litres a day for about a quarter of a century might be well worth preserving in case the dreaded cow-pox breaks out in pandemic proportions and we don't like black coffee.

Back At Computers

One computer application that impinged on local cows was one I looked at some time ago, when the CSIRO was vitally interested in tracking the movements and other activities of the cows it kept in a vast paddock near Alice Springs. This, by the way, is not another Dingo joke.

It seems the CSIRO people built a series of non-removable and cow-proof collars, which they mounted on the cows, which were then left to their own devices in the paddocks. Each collar had a method of recording the cow's activities. (Best not looked into too closely unless you are into animal husbandry, and you had better get that under control, too, or spend some time at Her Majesty's Fanny Bay Motel in Darwin!)

At regular intervals, a radio beam was used to activate the collars on the cows. As the collar was activated, it radioed its stored information back to the experiment centre. The cow's direction from base was worked out using radio location, and its distance by timing the signal delay, thus, the researchers were able to tell where the cow was at stated intervals, and what it had been doing.

Still an invasion of bovine rights, but rather more pleasant than working out how many Big Macs it would make while still on the hoof, or measuring its response to mammary stimulation. □

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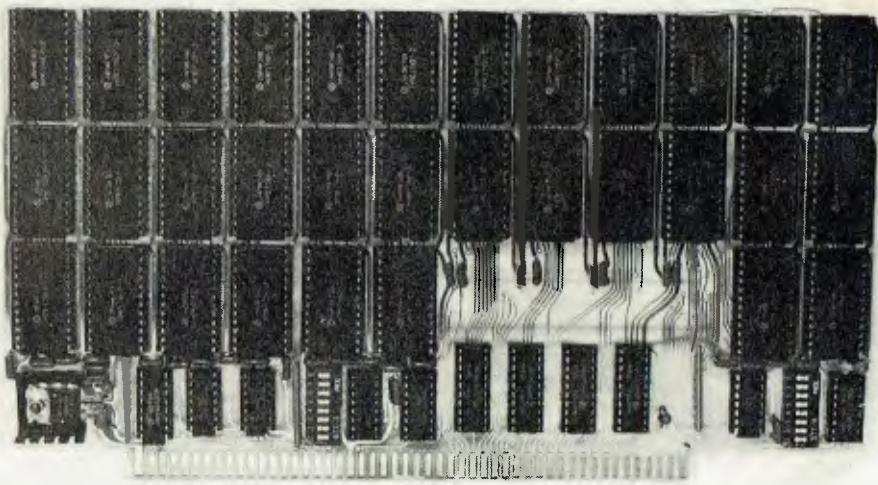


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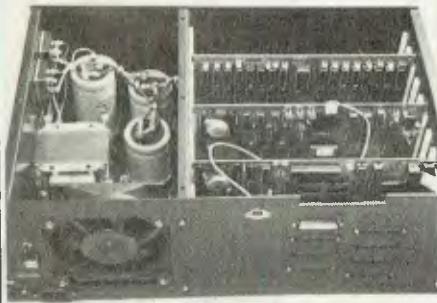
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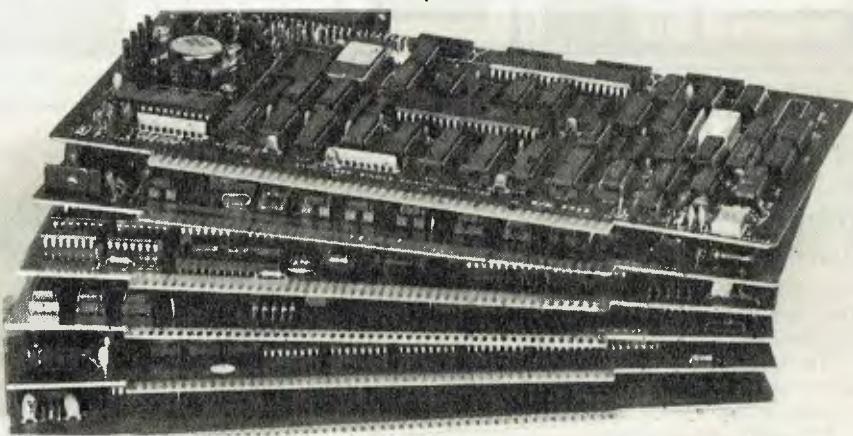
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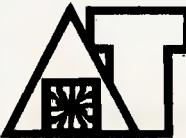
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Paul Beaver

RIGHT THAT'S IT! I've had enough! There seems to be a conspiracy in Australia to convince the micro-world that there is not software backup for the Sorcerer. **THIS IS WRONG!**

Here is just a short list of the people from whom I have bought software in the last three months — in alphabetical order:

Customized Technology,

Mail order address: PO Box 461, Ashfield 2131 **Phone:** (02) 799 6373

Customized Technology is the Australian rep. of the Global Software Network. It has a range of high resolution arcade games, a couple of good war games (Starbase Hyperion, reviewed previously). It also has a couple of very good graphic utility programs.

One of its best offerings is the Music Program and the Piano Player option which I reviewed a couple of issues back. It is continuing to support this package by releasing new tunes.

Dick Smith Electronics,

Mail Order address: PO Box 321, North Ryde 2113, **Phone:** (02) 888 3200

The original and certainly largest retailer of Sorcerer Software/hardware. If you own a Sorcerer, chances are you have bought it from "Tricky Dicky".

The stores carry a range of the Quality Software Programs including the graphic animation package (previously reviewed) and the de-bugging package, as well as a selection of those damned addictive adventure games. Also available is CP/M

plus disc basic for both Exidy FDS and Micropolis disc drives.

Dick Smith Electronics also has a range of University Software Program books. Program listings for the Sorcerer grouped into several categories including educational, scientific, fun and games, home and business. I believe these books give excellent value for money even if you have to enter the programs yourself.

Software Source

Mail Order address: PO Box, 364, Edgecliff 2027, **Phone:** (02) 33 4536

The Software Source has an incredible range of Sorcerer software. There are over 45 tape based programs and 30 disk programs.

There is no way I could list all of the programs in the catalogue but I would like to mention some of its disk software.

For the Micropolis 13cm drives running under CP//M 2.2, Software Source has the BDS-C compiler, BASIC 80 (there is a compiler available) FORTRAN 80, COBOL 80, Pascal MT, CBASIC 2 and even WordStar. If you want to get serious about other languages, you can with the Sorcerer and Software Source programs.

By the way, Software Source is a specialist in Sorcerer software/hardware.

System Software

Mail Order address: Ken St, Bicton, WA 6157, **Phone:** (09) 339 3842

System Software is another specialist in Sorcerer software/hardware. It carries

a range of good high resolution arcade games, a great editing package (System 3 to be reviewed next issue) and EDOS, a DOS for Micropolis drives that will save a basic program to the disc, give high and low resolution point plotting, recover old programs and turn on and off the printer. It even has a command for variable sound output (This will also be reviewed soon).

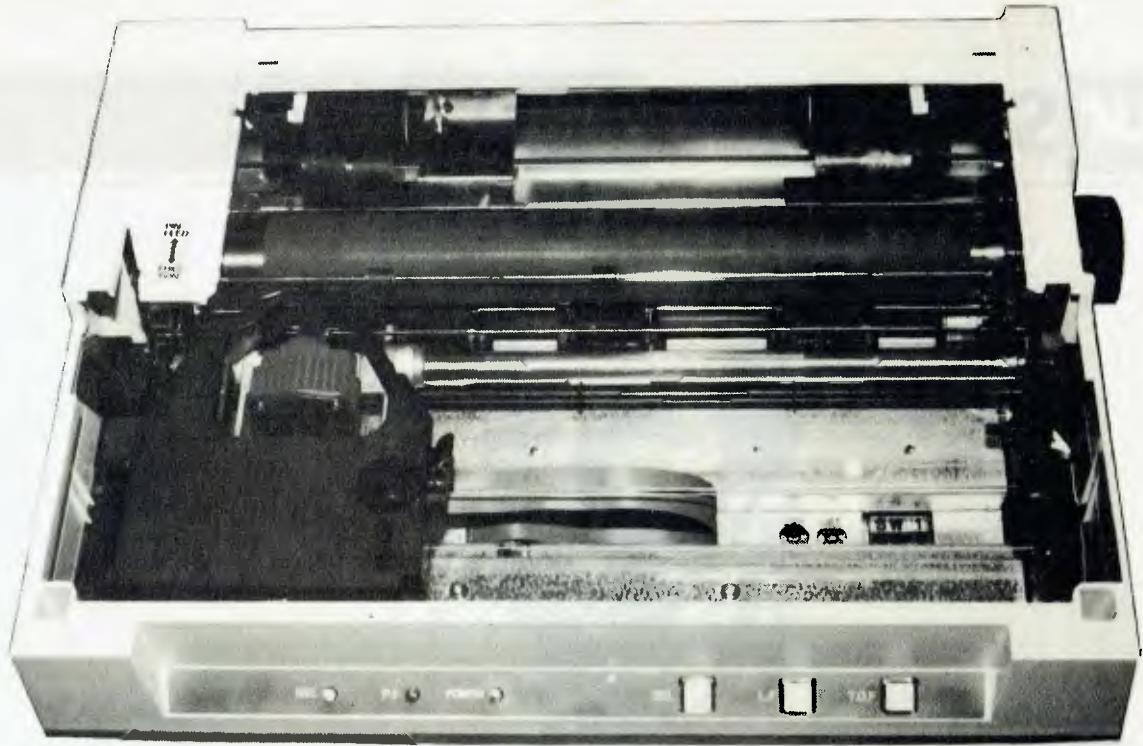
System Software is currently running a software competition with a \$500 prize in each of several categories.

As I said earlier, this is not a full listing of all the people who sell Sorcerer software nor is it even a full list of all the addresses of the above retailers. All have re-sellers and most have branches other than the mail order addresses. The biggest, Dick Smith Electronics, has 23 stores and around 200 agencies.

So write and ask the retailer of your choice for a catalogue or ring and ask for the agency nearest you.

If you are a retailer of Sorcerer software or hardware, and I missed you out send me a catalogue c/- Your Computer. I would like to compile a list of people who supply Sorcerer software/hardware in Australia and even a few of the better overseas retailers. The more people who contact me the better the list will be.

Starting next issue **THE GREAT PUN CONTEST.** There will be prizes, so start thinking up those stinkers..



As the prices of printers continue to drop, many users are now able to contemplate adding one to their system. LES BELL reports on the latest printer to hit the Australian market.

WHAT'S ITOH YOU!

JUST WHEN all the *Your Computer* staff have taken delivery of their brand new shiny Brand X printers someone has to go and release a new machine with even more bells and whistles! Of course, it's an occupational hazard in the computer industry; everything we touch depreciates so fast you can see the dollars burning up.

The new-fangled piece of apparatus under consideration comes from C. Itoh, the Model 8510. This is a small, neatly finished piece of gear, similar in size to the Epson MX80, but with a few tricks of its own.

The first thing you notice, on the left top side of the cover, is a 'switch' marked 'Pin Feed/Friction'. This printer will accept either standard continuous stationery with sprocket holes or single sheets, using friction feed. The platen is constructed of solid rubber, just like a typewriter's. How this will wear under the continual hammering of the dot matrix print head remains to be seen, but I'd guess it would wear not much faster than a standard typewriter platen.

The print quality of this machine is excellent. The characters include full de-

your computer REVIEW

scenders on lower case, and may optionally be proportionally spaced. People in the microcomputer industry find dot matrix printing acceptable for correspondence, but this is good enough to compare with typewritten material. The typeface is easy to read — my only objection is that it doesn't look 'computerish' enough; listings look quite unnaturally neat.

Several different character pitches are possible: 80, 96, and, for really compressed print, 136 characters per line. In all pitches, print may be expanded to double width, and pitches may be mixed within one line. Underlining is possible, and to provide more natural appearance for compressed text, the length of a line feed may be set to any integral number of one-hundred-and-forty-fourths of an inch. The print speed is 100 characters per second.

Negative linefeeds are also possible, giving the printer the capability to print superscripts and subscripts. With a little

imagination, mathematical equations are possible. However, the standard character set includes numerical superscripts, as well as properly formed $\frac{1}{2}$ and $\frac{1}{4}$ and mathematical symbols.

Printing can be either character by character as received, or the more conventional buffered logic seeking operation which most bi-directional printers perform.

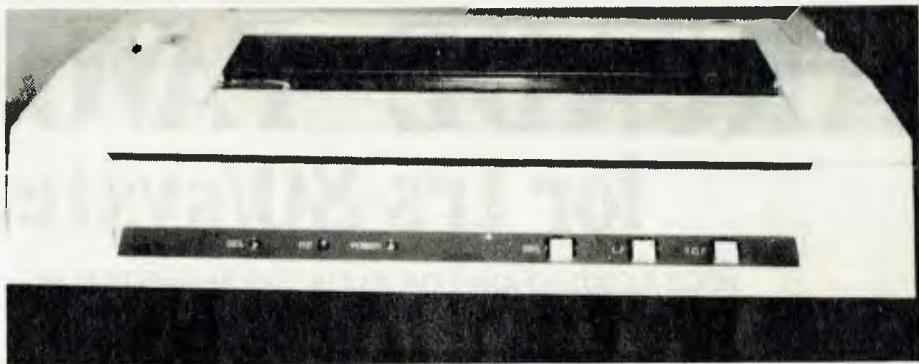
Under software control, there are a number of adjustments that can be made to the printer. These include setting up of the variable forms unit, which specifies horizontal and vertical tabs, form length and margins. A set of DIP switches allows selection of character set (including several European variants), buffer protocol, select or deselect on power-up, whether or not there is a slash through the zero, recognition of select/deselect codes and device address. This last feature is interesting. It allows up to four printers to be connected to the same interface, and selected under software control.

The 8510 printer supports graphics in two ways. It has a graphics character set, which is accessible using only 7-bit codes,

as well as dot-addressable graphics, which require an 8-bit interface.

An RS-232C interface is available as an optional extra, and this allows the printer to use any of several hand-shaking protocols, in just the same fashion as a daisy-wheel printer. The standard interface is a Centronics type.

Perhaps the best thing about this printer is the price — \$899 including tax. Our review sample came from Software Source, 89 Oxford Street, Bondi Junction.



THIS IS A DEMONSTRATION OF THE ITOH 8510 DOT-MATRIX PRINTER

This remarkable printer will print in a number of different character pitches: EXPANDED characters are available in all modes.

This paragraph is printed at the standard 80 columns per line, and is extremely readable. All characters may be underlined as well. This is the standard character size which will normally be used.

This is standard "PICA" pitch giving 80 columns per line.
And this is printed in "ELITE" pitch, giving 96 characters per line.

However, if you require more compressed print, you can set the printer to print at 136 characters per line, using the standard one-sixth inch linefeed size. Again, underlined characters are also possible. This paragraph has been printed using this format.

You can also use this character pitch, and compress the linefeed size to one-eighth of an inch to give a more even overall appearance in the compressed mode. This will allow you to fit 88 lines of print on a standard 11-inch page.

The above paragraphs are repeated here with the boldface option to each of the above character pitches:

This paragraph is printed at the standard 60 columns per line, and is extremely readable. All characters may be underlined as well. This is the standard character size which will normally be used.

And this is printed in "ELITE" pitch, giving 96 characters per line.

However, if you require more compressed print, you can set the printer to print at 136 characters per line, using the standard one-sixth inch linefeed size. Again, underlined characters are also possible. This paragraph has been printed using this format.

You can also use this character pitch, and compress the linefeed size to one-eighth of an inch to give a more even overall appearance in the compressed mode. This will allow you to fit 88 lines of print on a standard 11-inch page.

Character Pitches may be mixed within a line.

Linefeeds may also be selected in any multiple of one hundred and forty fourths of an inch as you will see. These linefeeds may be UP or DOWN.

This line is printed downward and then printed upward to demonstrate the remarkable power of this printer.

This negative linefeed capability can be used to generate superscripts and subscripts. A superscript font is available in the character set. Numbers like x^2 or y^{27} are easily implemented.

Chemical symbols such as H_2SO_4 are possible.

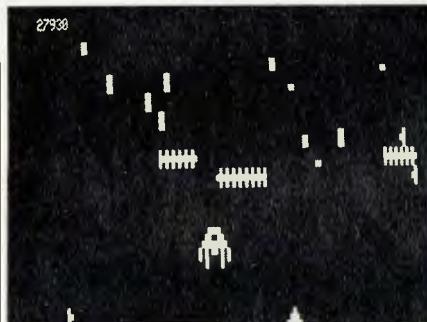
Mathematical equations are equally possible like this: $\alpha \approx \frac{\pi r^2 H}{32}$

Graphics Characters may also be easily printed using the ITOH 8510. The full Graphic character set is printed below. And You can programme your own graphics characters if you like

ARCADE FAVOURITES

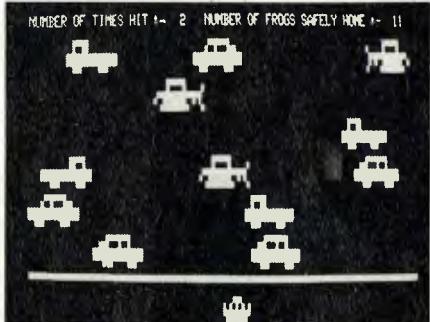
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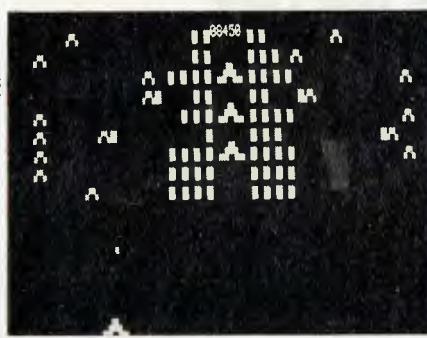
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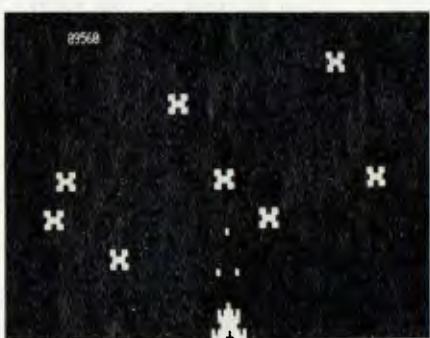
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that, cross the
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232C serial ports, with provision for a third. Each channel provides the data signals and the primary handshake signals, and is ideal for connecting modems, printers and similar equipment. There's also a cassette interface, if you need it.

Wide Software Selection

The H89 is well supported with a wide selection of software. The standard operating system, supplied with the machine, is HDOS Version 2.0. This operating system is reminiscent of CP/M, but with a TRS-DOS flavour to it.

On power-up, the system restarts and enters its monitor program. To boot the operating system, just type B, and the system will load itself into memory and start operating. Incidentally, the system can boot from any disk drive.

The Heath system is interesting in that all documentation and software uses octal numbering. Most manufacturers have gone to hex, but there are advantages to octal with the 8080 and Z-80 processors. Another reason for the use of octal is the H-8 computer's front panel operates in octal, and H-8 users of HDOS would be most used to that system.

H DOS is accompanied by a huge wad of documentation — much more than you get with CP/M. For example, Heath have obviously taken the sensible view that although you don't have to build the software, you still have to use it so they have transferred their excellent manual style to the software manuals.

The System Configuration section enables the user to install HDOS on his system, be it a H-8 or H89, with 13 cm or 20cm disks. The manual details the step-by-step procedure to be followed, and then describes the theory of operation and optimization of the various utilities that are supplied with the system.

Beginners Re-assured

The attention to detail in all Heath manuals is mind-boggling. Take this quotation from the System Configuration section:

"It will take you about three hours to complete the System Set-Up Procedure. Don't be afraid to stand up and stretch or get a drink if you have to, even if you are in the middle of a copying operation. The computer will still be waiting when you return."

Information such as that may be obvious to the experienced user, but when you're just starting out with your first computer, such re-assurance is invaluable.

As part of the system configuration process, the user is provided with two diagnostic programs, which can be run to demonstrate that the system is functioning correctly.

When HDOS signs on, it asks the user for the date, and dates all files at creation or update. Most of the commands are built

into the operating system, so to run a program you must type RUN progname'.

Filenames are similar to CP/M's — eight characters, period, and three-letter extension. Various switches are available to the CATalogue and PIP (peripheral interchange program) commands, to specify system files, specify long or short form catalogue listings and display file sector allocation.

Disks must be explicitly mounted and dismounted; that is, they must be logged in using the MOUNT command and DISMOUNTed when they are removed. A useful utility called ONECOPY allows the user with only one disk drive to copy files between disks.

Sophisticated Features

The system maintains device drivers as disk files to be loaded when required, rather than integrating them into the operating system, as many other OS's do. This enables the user to quickly and easily reconfigure the system to drive, say, a new printer, without fear of damaging his operating system. Several device drivers are supplied as standard for the common Heath peripherals, and these provide quite sophisticated features.

For example, the printer device drivers allow the user to specify: whether or not he wants tabs expanded; automatic insertion of a form feed at the end of a listing; specify the number of lines per page and

Specifications and Report Card

Unit:	Heath/Zenith H-89
Made By:	Heathkit
Processor:	Z-80
Clock Speed:	2MHz
RAM:	48K
ROM:	4K
I/O:	2 serial ports
Languages:	Extended Benton Harbor BASIC, Microsoft BASIC, Assembler
Keyboard:	QWERTY, with numeric/editing pad and user-definable keys
Display:	124 × 80 green phosphor, very clean
Graphics:	Limited graphics character set
Peripherals:	Build-in mini disk drive, cassette interface
Expansion:	Additional disk drives (13cm and 20cm)
Best Points:	Excellent Heath documentation, superb terminal design, good software
Worst Points:	No faults to speak of

Ratings:	excellent	good	well, maybe	poor
Documentation	✓			
Ease of Use	✓			
Functionality	✓			
Support	✓			
Value-for-money	✓			

Price: \$3400 (Complete)

Review unit from: Warburton Franki

the width of the page; and change the baud rate. This is considerably more intelligent than the average system's printer driver.

However, much of the Heath software shares an attribute that almost drove me up the wall — Command Completion. As soon as you type a letter at the beginning of a line BASIC examines it, to see if it is all the information it needs to identify the statement you want to type.

For example, if you type P, then it knows that could be PAUSE, POKE or PRINT. As soon as you type the R., then it completes the word, and PRINT appears on the screen. If you already type quickly, you find yourself typing over a lot of the time. But if you can't type, this is probably a lifesaver.

The system includes a debugger program, which allows the user to perform the usual debugging functions on machine language programs, including displaying and altering the contents of memory, and processor registers (though only the 8080 set), single-stepping through a program, and running a program with breakpoints.

The HDOS editor is a mainframe-style editor; that is, it is not screen-oriented (despite the cursor-control keys on the H-89), but rather line-oriented. It is certainly comprehensive, and appears to be quite powerful, though to savour the full flavour of an editor you have to use it extensively.



something I was not able to do for this review. Even the most (apparently) primitive editors can do quite surprising things quickly, when driven by someone who understands them.

The assembler on the system is an 8080 assembler (again, to suit the H-8), and is fairly standard, except for the ability to include other files into the source file, using the XTEXT pseudo-op. It includes SET, and some listing control ops, but does not handle macros. An appendix to the manual gives some useful pointers on assembly language programming, and shows how to link to HDOS, with some examples.

Back to BASICs

The standard BASIC for the H-89 is Extended Benton Harbor BASIC.

This is an interesting BASIC in several ways. For example, it is possible to create a kind of interrupt handler in BASIC, so that if a control-B is typed at the keyboard, the BASIC Interpreter completes the line presently being executed, and then GOSUBs to a pre-allocated routine to perform some task. This is a trick you can probably think up some imaginative uses for.

Second, it relies heavily on disk access. All its error messages are complete

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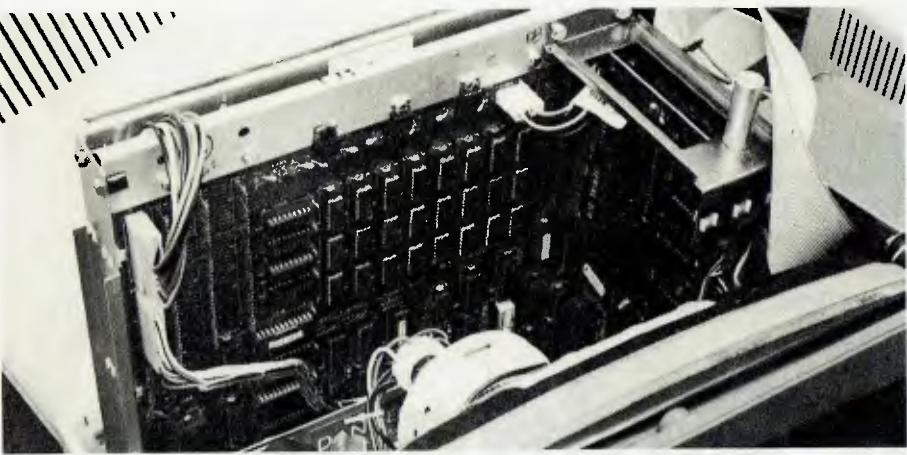
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and helpful, and to save memory space, they are stored in a disk overlay file, and only accessed when required. This means when your program halts because of an error, there is a short pause while the system looks up the error message, and then it explains, in no uncertain terms, what you've done wrong.

HDOS itself makes extensive use of overlay files, and this could slow down BH BASIC. But a special command causes the HDOS overlays to be loaded into memory and left there, speeding up all the file access routines considerably, at the cost of 2.5K of RAM. Flexibility is the keynote.

The FREEZE command saves the BASIC, your program, and all variables onto a disk, allowing you to stop work and resume it again later

Seeking the Familiar

For those who want a more standardised BASIC, Microsoft BASIC is available for the H-89. It's the usual full-functioned MBASIC we've come to know and love.

And for those who want a more standardised operating system, CP/M is available from Heath. It's a nice implementation, done in the style of HDOS, with comprehensive documentation, con-

sisting of the Digital Research manuals, plus an introduction and some extra information in appendices. The BIOS is large, so it is stored on a SYS file hidden on the disk — a technique now becoming standard on bigger systems.

In summing up, the H-89 is a well-designed and easy-to-use system, which would be ideal for a small office system or as a personal system. It is not designed to be easy-to-use or friendly, but its documentation makes it easy to learn.

Although we didn't build the Heathkit version of this computer, we have no doubt the Heath manuals are up to their usual standard, and someone with a couple of smaller projects under their belt would have little trouble with this one.

In fact, the H-89 kit comes largely pre-assembled. The terminal logic board is pre-wired, as is the CPU board, the floppy disk controller and the cassette interface. That only leaves the power supply board and the video driver to do.

Heath has obviously thought hard about how to set up and test the the unit with the minimum of equipment. For example, a routine in the monitor can be used to adjust the motor speed of the disk drive, by simply adjusting a knob while reading the numbers displayed on the screen.

Heathkit and Zenith are represented in Australia by Warburton Franki — see the phone book for you local office. □

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Continuing his introduction to BASIC programming, LES BELL looks at saving programs, subroutines, how to handle arrays, and the difference between a command, a statement and a function.

Basic for Birdwatchers

Part III

Deletions

NOW WE can step over to the word NUMBERS and type:

7DIBARS<ESC>

where <ESC> means the ESC key.

There are other subcommands in the edit mode. For example, the X command moves the cursor to the right end of the line and enters insert mode, so that you can add onto the line. The H command will 'hack off' the rest of the line to the right of the cursor, and enter insert mode so that you can retype sections of a line.

The S command will search for a character. If preceded by a digit n, it will search for the nth occurrence of the character. So 3SP will move the cursor to the third P in the line, and print all the characters before it. The K command kills all characters before the specified character, so: 3KP would delete every character up until the third P, and wait for the next command.

Several commands are provided to exit edit mode. Normally, pressing C^{a} will print the remainder of the line and exit edit mode E just will exit, and Q will scrap any alterations and leave edit mode with the original line intact. A does the same thing as Q, but automatically restarts edit mode to give you another bite at the cherry, while L prints the balance of the line, and restarts edit mode.

The C command allows the user to change the next n characters to something else. The command 4CGOTO would delete the next four characters, replacing them with the word GOTO. Beware! The number of characters you insert *MUST* be the same as the number you delete, otherwise strange things will happen!

your computer



Finally, to delete characters behind the cursor, just use the DEL key.

Saving Programs

Now that we can edit programs, we will be tackling much larger projects, and it would be nice if we could save our programs on cassette or disk to save us retyping them.

Cassette interfaces, and the way they work, vary enormously from machine to machine. In general, the procedure is this:

Plug in the cassette recorder, according to the computer handbook, and switch it on. Insert a blank cassette, and move the tape forward past the leader and onto the magnetic material. If your cassette recorder doesn't move, you may have to temporarily unplug the "pause" plug (usually the smallest).

With all cables connected, and the blank tape at the right place, type CSAVE or, if your computer allows it, CSAVE "filename", and hit RETURN. The tape should start to move for a few seconds as the computer saves the program on tape. Once it has finished, rewind the tape ready for reloading.

To load the program into the computer is a similar procedure. Move the tape to a point just before the start of the program, insert all cables, and type CLOAD or, optionally CLOAD "filename", and hit RETURN.

The computer should now load the program off the tape. It may be necessary to experiment with the volume control when loading, as most cassette interfaces are sensitive to the input level.

If you type CLOAD "filename", most computers will read in the next program if it has the right name, otherwise it will skip over programs until it finds the right one. If you put multiple programs on a tape, jot down readings from the tape, index counter to mark where programs start, so that you can reposition the tape to the right place later.

Saving programs on disk systems is much easier and quicker.

Just type SAVE "filename", and the computer will save the file to disk. It can be reloaded by typing LOAD "filename".

You may be able to load and run a program in one operation by typing RUN "filename".

Functions

As well as the statements and commands we've already learnt (and there are more to come,), BASIC provides things called functions. In this section, we're going to learn what these functions do. But first, what's the difference between a command, a statement, and a function?

A command is an instruction to the computer to do something immediately. For example, RUN or LIST or AUTO.

A statement is a line of code, or part of a line, which the computer will store for later execution. When executed, it provides the instructions which the machine will follow.



It's rather like a sentence, in that it contains a verb (GOTO, INPUT, PRINT) and some objects which the verb acts upon, either variable names (X, A, Z9), constants (1, 3.14159) or line numbers (250, 80010).

A function acts upon some other value or variable to provide a new value. It is said to **return** that value. For example, you might want the sine of an angle. BASIC provides a function to perform this calculation, thus:

$210 L = \text{SIN}(A)$

Notice that we set L equal to the value returned by the function. This is a good way to distinguish functions from statements. For example, you can't say:

$250 L = \text{GOTO} 330$

because GOTO 330 doesn't have a value, that is it's not a function.

Here are some of the functions commonly provided in BASIC:

ABS(X)	absolute magnitude of X; if $X < 0$ then $\text{ABS}(X) = -X$
ASN(X)	arcsine of X (rarely seen)
ACS(X)	arccosine of X (rarely seen)
ATN(X)	arctangent of X
COS(X)	cosine of X
EXP(X)	transcendental number e raised to the power of X
INP(X)	input from port X
INT(X)	integer part of X
LOG(X)	common logarithm of X
PEEK(X)	read the contents of memory location X
RND(X)	random number
SIN(X)	sine of X
SQR(X)	square root of X
SQRT(X)	same as $\text{SQR}(X)$ (rarely seen)
TAB(X)	produces a string of X spaces

Don't worry about what these functions do — that's mathematics, not computer programming. If your intention is to use the computer to solve mathematical problems, then I guess you know what they do already, otherwise you may only need the INP, INT, PEEK, RND and TAB functions, which aren't strictly mathematical. INP and PEEK will be explained later, and RND you've met already.

INT returns the integer part of a number, so for example, INT(27.34) is 27, INT(3.141592654) is 3. Watch out for negative numbers, though — INT(-3.141592654) is -4. This is because the definition of INT is the "largest integer less than the original number." Therefore, -3 is GREATER than -3.141592654, not less. less.

TAB simply produces a string of spaces. So TAB(5) prints 5 spaces, and TAB(15) prints 15 spaces. This is particularly useful if you're laying out printed reports. And it's particularly useful if you're less.



trying to copy a program from a printer page. Which is easier to follow:

```
10 PRINT "HANURABI"  
or  
10 PRINT TAB(17); "HANURABI"
```

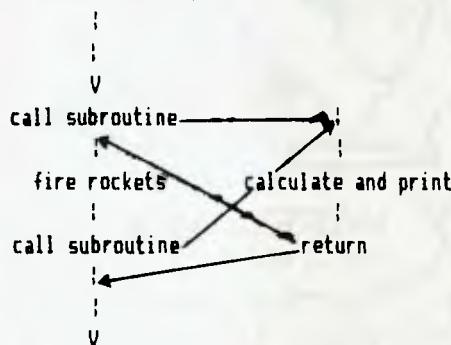
They both do the same thing, but the TAB function spells it out clearly.

Programs within Programs

Quite often, we find within a program that we have blocks of instructions that perform the same job at two or more points in a program. Now, computer programmers have a phrase to describe that kind of situation — they call it "re-inventing the wheel". After all, if there was a way to use the same set of instructions from different points within a program, that would make life a lot easier, with fewer typing mistakes and shorter programs.

Well, there is a way to do this, and in programming parlance it's called a **subroutine**. For example, suppose we have a program which simulates the flight of a spacecraft around a planet, and that we want the program to calculate and print the height of the spacecraft both before and after it fires its manoeuvring rockets.

Here's one way to do it:



Calling a Subroutine

In BASIC, there is a special keyword that is used to call subroutines. The statement: GOSUB lineno will transfer control to the given line number, until such time as a RETURN statement is executed, when normal execution resumes with the next statement after the GOSUB. So, in practice, if this was a program, it would be laid out like this:

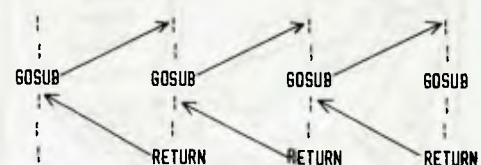
```
10 REM SUBROUTINE DEMO  
20 REM  
  
150 GOSUB 1000  
160 LET . . .  
  
250 GOSUB 1000  
260 GOTO . . .  
  
990 END  
1000 REM ** CALCULATE AND PRINT POSITION **  
1010 LET . . .  
  
1080 RETURN
```

Notice how the program is organised. The flow is quite naturally from top to bottom, and, as long as we know what the subroutine at line 1000 does, it makes it easy to follow the main program. The main program ENDS before the subroutine, in order to avoid accidentally executing it. This is not mandatory, but it is good programming style.

Now let's look at what happens when the computer comes to a GOSUB. It knows that although it is about to jump to another part of the program, it's got to come back to this part when it's done, so it remembers the line number of the next statement that it would normally execute. That's the one it will continue with when it RETURNS. It sticks this onto a list of such line numbers called a **stack**, and then goes wherever the GOSUB commands.

When the subroutine has done its job, the computer will come to a RETURN statement. This tells it to take the return address off the stack again, and go back to it. (By the way, the computer uses the stack to hold line numbers during FOR-NEXT loops too — can you see why?).

The stack is an interesting kind of memo pad, in that the computer can stick as many line numbers on it as it likes, but it can only read them back out in reverse order to the way they were written. This means that whenever a RETURN is executed, it terminates the most recently called subroutine, and the next RETURN finishes the one before that, and so on. We call subroutines within subroutines **nested subroutines**.



Arrays

Before we start writing programs that use subroutines, let's get into another useful BASIC structure, — arrays.

Quite often, we find it useful to present a collection of related figures in the form of a table. For example, we might collect rainfall figures over a year:

Month: Jan Feb Mar Apr May Jun Jul Aug Sep

Rain: 4" 3" 3" 5" 5" 5" 8" 7" 6"

BASIC allows us to store these related values in one, admittedly complex, variable, called an array. Arrays are named like ordinary variables, except that they have an associated number, called a subscript. So, if A is an array, the A(5) is the sixth entry in the array (don't forget A(0)!). For our rainfall chart, we could have

A(0) ! A(1) ! A(2) ! A(3) ! A(4) ! A(5) ! A(6) ! A(7) ! A(8)
4 3 3 5 5 5 8 7 6

The first element in the array is A(0), which has a value of 4, the second is A(1) which has a value of 3, and so on.

Some BASICs start arrays with the zeroth element, whereas some start with the first; this is something to check up on. A few offer the user the option, by using a statement like

OPTION BASE 0 (or OPTION BASE1) to let the user set it up the way he prefers. There's an old joke that says if you ask someone to count up to 10 they'll go: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 — except someone who works with computers. He'll go: zero, 1, 2, 3, etc.

Array variables can be used in assignment statements in exactly the same way as ordinary variables, so you can say:

360 A(6) = X + B(6)

Before you use an array in a program, if it will have more than 10 elements in it, you must inform the BASIC interpreter, so it can reserve space for the array. You do this with the DIMension statement:

40 DIM A(32), B(32), M(64)

which will reserve storage space for three arrays, two of 32 elements and one of 64.

Arrays are particularly potent when used with loops. Suppose you've got an array of 12 values which must be input. This can be done by putting the input statement inside a loop:

```
10 DIM V(12)
20 FOR I = 1 TO 12
30 PRINT "VALUET"
40 INPUT V(I)
50 NEXT I
```

This loop will ask for a value 12 times and store the values in succeeding elements of the array V. You can print arrays in a similar fashion.

String Arrays

It is possible to have arrays of strings (in Microsoft BASIC — sorry, NorthStar owners). We'll show an interesting use of string arrays later. Let's look first at how arrays can be used and at the same time, we'll start to look at the use of subroutines — our programs are becoming big enough to make use of them.

The problem we're going to solve is quite a common one around computers — it's the kind of job they're good at. Let's suppose we want to sort a sequence of numbers into increasing numerical order. There are several ways to do it; we'll use the Standard Exchange Sort, otherwise known as the Bubble Sort.

The idea behind Bubble Sort is very simple. We start at the bottom of an array and compare the first two numbers. If the first is larger than the second, then we swap them. Otherwise, we just leave them as they are. We now move on to the second and third numbers and repeat the process, then the third and fourth, and so on.

After we've completed this sequence for every pair of adjacent numbers in the array, we will have moved the highest number into the last location of the array, and we can now repeat the procedure, which will move the second highest into the second last location. So, to sort n numbers, we have to make n-1 passes through the array. We can save some time, however, by noticing that once the last location is right, we don't have to compare it, and the same applies to the second-last, third-last and so on as we know they are in the right place.

If this seems complicated, follow this example:

Array at start:

5 2 3 6 1

First compare, and swap:

2 \leftrightarrow 5 3 6 1

Second compare and swap:

2 3 \leftrightarrow 5 6 1

Third compare, no swap:

2 3 5 \leftrightarrow 6 1

Fourth compare and swap: (puts highest number in last location)

2 3 5 1 \leftrightarrow 6

Start of second pass, first compare, no swap

2 \leftrightarrow 3 5 1 6

Second compare, no swap:

2 3 \leftrightarrow 5 1 6

Third compare, swap:

2 3 1 \leftrightarrow 5 6

No need for a fourth compare, as we know last element is right.

Start of third pass, first compare, no swap:

2 \leftrightarrow 3 1 5 6

Second compare, swap:

2 1 \leftrightarrow 3 5 6

No need for a third compare, as we know fourth element is right.

Fourth pass, first compare and swap:

1 \leftrightarrow 2 3 5 6

No need for a second compare, as we know third element is right. This completes the sorting of the array.

Now here's a program which does the same thing, based on a simple exchange sort algorithm:



```

100 REM *** SORT DEMONSTRATION V1.0 ***
110 REM      WRITTEN IN MBASIC 4.4
120 REM      27/10/81
130 DIM V(100)
140 PRINT "SORT DEMONSTRATION"
150 REM INPUT CONTENTS OF ARRAY,
   ENDING WITH ZERO
160 N=1
170 INPUT V(N)
180 IF V(N) = 0 THEN 210
190 N=N+1
200 GOTO 170
210 N = N - 1
220 :
230 REM START SORTING
240 X = 0
250 FOR I = 1 TO N - 1
260   IF V(I) > V(I+1) THEN GOSUB 370
270 NEXT I
280 IF X = 0 THEN 310
290 GOTO 240
300 REM PRINT RESULTS
310 FOR I=1 TO N
320   PRINT V(I),
330 NEXT I
340 END
350 :
360 REM SWAP SUBROUTINE
370 T = V(I)
380 V(I) = V(I+1)
390 V(I+1) = T
400 X = 1
410 RETURN

```

Line 130 dimensions an array with 100 elements, and then lines 150 to 200 allow us to input the members of the array. Because we don't know in advance how many numbers we're going to input, we've

used an old programming trick of using an unusual value to terminate the input. In other words, the program will always accept a zero as the last element, and jump to the sort routine proper.

This sort keeps making complete passes through the array, setting a flag (X) each time it makes an exchange (line 400), and resetting it to zero at the beginning of a pass (line 240). If the flag is zero at the end of a pass (line 280) then there were no swaps in that pass, and the array must be in order.

Lines 310 to 340 simply print out the array. Notice the comma in line 320, at the end of the print statement. This is a variation on the semicolon we've been so careful about, and its effect is to print the results in **fields**, each 14 characters wide. This is very useful for producing tables of output.

Notice also our use of the GOSUB to line 370. This enables us to put our series of instructions which perform the swap tidily out of the way at the end of the program.

Now, remembering what we said earlier about not having to complete a pass because we knew the larger values were already in their correct places at the end of the array, let's rewrite the sort, and tidy it up:

```

100 REM *** SORT DEMONSTRATION V1.1 ***
110 REM      WRITTEN IN MBASIC 4.4
120 REM      27/10/81
130 DIM V(100)
140 PRINT "SORT DEMONSTRATION"
150 REM INPUT CONTENTS OF ARRAY,
   ENDING WITH ZERO
160 N=1
170 INPUT V(N)
180 IF V(N) = 0 THEN 210

```

```

190 N=N+1
200 GOTO 170
210 N = N - 1
220 :
230 REM START SORTING
240 FOR P = 1 TO N-1
250   FOR I = 1 TO N-P
260     IF V(I) > V(I+1) THEN
        SWAP V(I),V(I+1)
270   NEXT I
280 NEXT P
300 REM PRINT RESULTS
310 FOR I=1 TO N
320   PRINT V(I),
330 NEXT I
340 END

```

Several things combine to make this a neater program. Firstly, the algorithm is expressed more neatly, using a counter P (line 240) to control the number of passes through the array, while the I counter still indexes through the array. Secondly, I only runs up as far as N-P, stopping short of the end of the array, because, as we've pointed out, there is no need to go that far. Thirdly, we've replaced the swap subroutine with Microsoft BASIC's SWAP statement — okay, we admit it! We were holding out on you all along!

Here's some work for you to do. Type in both the sort programs into your computer and run them both with the following data:

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 2 1 3 4 5 6 7 8 9 10 11 12 13 14 15 0 1 2 3 4 5 6 7 8 9 10 11 12 13 15 14 0

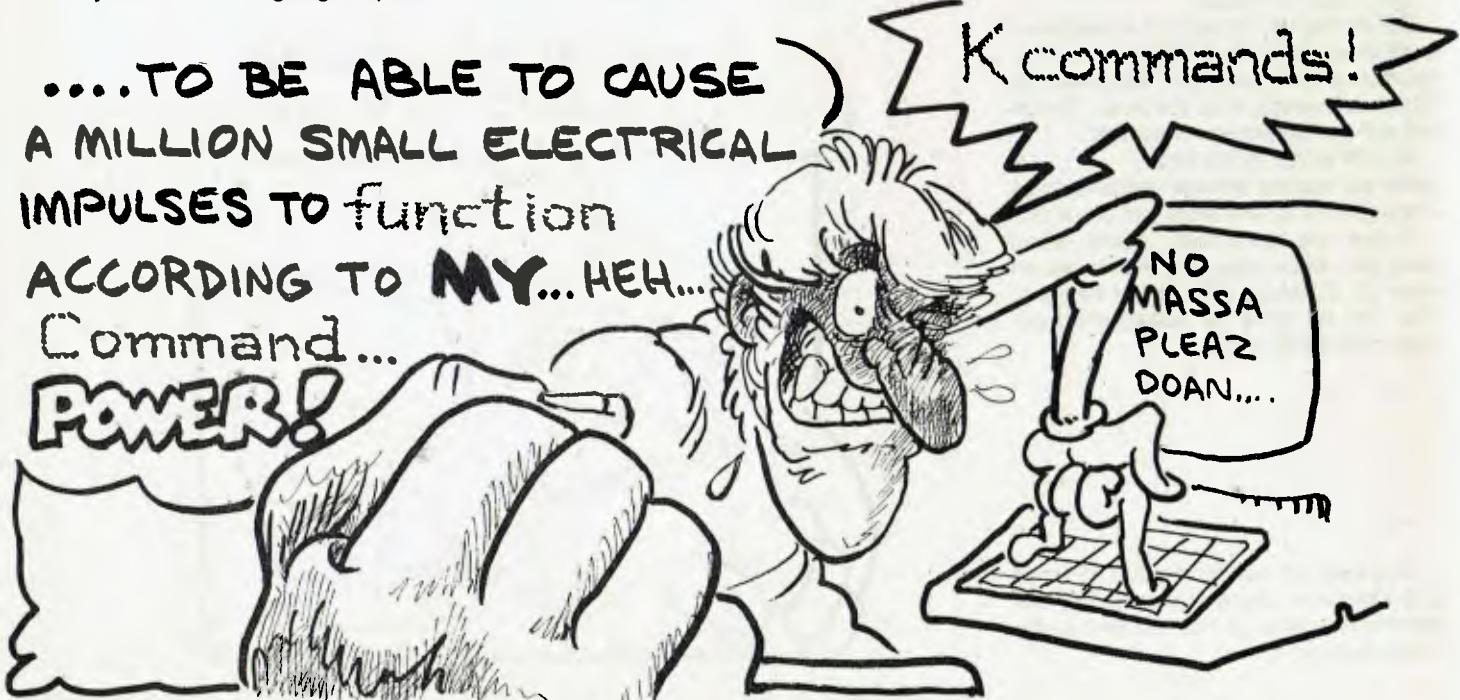
Which is faster, and why? Under what circumstances is each faster? □

....TO BE ABLE TO CAUSE
A MILLION SMALL ELECTRICAL
IMPULSES TO function
ACCORDING TO MY... HEH...
Command...

POWER!

ΣK commands!

NO
MASSA
PLEAZ
DOAN....



MAVERICK provincial businessman Frank Goldingham is widely credited with having the best personal computer retail shop in the nation. His is a supermarket approach, with software packs lining the walls, and a complete systems approach.

Goldingham first became interested in computing when he computerised the production of his fleet of small newspapers. Then, at the beginning of this year, Goldingham, decided to concentrate entirely on computing. He sold his newspapers and went into microcomputer retailing.

Goldingham's special selling benefit is to offer a very large selection of hardware instead of just one brand, which has tended to be the practice of New Zealand. He was the first retailer to display software on the wall.

His Computer Centre stocks Radio Shack, Apple, Dick Smith, Commodore, Atari, and such relatively rare breeds as Interact. He is also New Zealand distributor for Instant Software and was the first to import Dick Smith computers direct.

Goldingham's pioneering of microcomputer retailing has made his shop a mecca for motoring micro enthusiasts. They happily drive the 100 miles north from Wellington to look over his range.

"I am extremely cautious about the brands I represent," says Goldingham, who claims he has turned several brands away because he wasn't sure about them. His biggest market has been small businessmen, such as builders wanting special purpose machines.

The micro, he says, has been a blessing for many small regional firms. "I'm always amazed by the performance my clients are deriving from their machines."

TREVOR FORREST is one of the busier people in Australasian microcomputing these days.

For starters, his MARC media selection software suite has just been presented to potential buyers in the United States; his retail computing shop has just opened in Wellington — the capital's first — after a prolonged battle with the City Council, which could not decide on the precise classification of a retail computer shop in the planning scheme, and he has signed on full time with an advertising agency in order to experience things "from the other side of the fence."

Forrest's media and audience research package was presented at meetings in the US by associate, Trevor Egerton. With ten Australian broadcasting stations using the



software, Forrest believes that its time to jump.

Forrest's retail shop can now get down to street level, after existing in an attic because the City Council did not find retail computing compatible with the downtown financial district. But Forrest persuaded them otherwise.

One wonders how he's going to fit everything in — and work full time at one of Wellington's most rapidly developing advertising agencies.

"I had to get over to the user's side," said Forrest. "It was time I looked much more closely at the application of the package," he said.

Forrest has boosted the speed of the MARC software fivefold since the beginning of the year and the package is to audience research what the flight simulator is to pilot training. You get the whole picture without leaving the ground. The system has become especially popular in New Zealand because of its ability to model and mix the various forms of media — print, television, cinema, radio.

The MARC software also condenses the research time between fieldwork and the actual advertising campaign. Market patterns can change quickly, says Forrest, and under traditional systems there is the constant danger of a campaign being based on out of date information.

KBR Mackinder agency director, David Wright explained: "In the past, we have seen an over-emphasis on the creative side of agency work, to the exclusion of pin-point media selection.

"We couldn't find a better way to move right out in front than with the world's leading audience research package — and the man who designed it," said Wright. The software at KBR Mackinder will run

on a Commodore 8000, which Forrest describes as the "most beautiful machine" he has ever seen.

THE CONGLOMERATES are rushing to snap up microcomputer agencies in New Zealand. Fletcher-Challenge, New Zealand's biggest company, has just bought out the Palmerston North Compumax company and its nationwide SORD agency.

Meanwhile in May, Fisher and Paykel, the nation's biggest consumer electronics group, snapped up the Mitsubishi agency. In September, Fisher and Paykel announced it had also acquired the National Panasonic agency.

Reacting to criticisms that the firm, whose main line is washing machines, had no software depth, Fisher and Paykel quickly signed up with the Auckland software house, Interactive Applications, for rights to the microCOBOL range. This software is compatible, for example, with the Panasonic JD850 and JD94 desktops.

Fisher and Paykel runs its microcomputer operation under a subsidiary, known as the Microcomputer Electronic Company. F and P prefer microCOBOL as an alternative to BASIC, a language which encounters market resistance here because it is deemed to be for beginners.

Several months ago, the entertainment/distributing chain of Kerridge Odeon, which runs most of New Zealand's cinemas, confirmed it had secured the Canon microcomputer agency. While KO has the national franchise for Canon cameras, it was by no means certain it would be given the Canon microcomputer business. KO's 25 per cent holding in New Zealand Xerox looked as if it might rule the chain out. KO, for example, does not handle Canon copiers because of the Xerox tie up.

Kerridge Odeon business equipment division director, Roger Jay, will clearly find himself involved in a head on clash with Fletcher-Challenge and Challenge/Sord.

The acquisition by Fletcher-Challenge of Compumax, was created by Compumax's fast growth, the company's founder, John Hardwick explained. "People were beginning to ask what would happen to their machines if something happened to Hardwick?"

Hardwick now moves from provincial Palmerston North to Wellington to head the Challenge microcomputing division. □



A STRONG aura of optimism now surrounds the Polycorp teaching device. There is a feeling that the microcomputer is now so far down the track that the Education Department will have to give it the green light, in one shade or another.

This optimism is reflected by the establishment in the Development Finance Corporation's own building of half a floor devoted to the administration of the new development. Actually, as I discovered after several hours driving the Polycorp, it is much more than just a teaching instruction device. It is, it seemed to me, more of a general purpose computer but with a strong dedication toward instruction.

Today, you can buy some test models off the shelf, and at \$3500, you have to admit that it ranks as an extremely good buy. It is very self-contained. Even the image manipulator is built into the key-

Designed by Wellington Polytechnic and programmed by Progeni, the Motorola 6809-based Polycorp microcomputer is more than simply a teaching instruction device, although these young Kiwis are suitably engrossed in that function. New Zealand Development Finance Corporation has established a section specifically to administer the project.

By Peter Isaac

board. No need to buy a joystick as an extra.

The Polycorp is based on the Motorola 6809. Engineering design is by the Wellington Polytechnic and programming by Progeni. The first thing to remember about the Polycorp is that this is no strings-and-ceiling-wax affair. It is backed by plenty of money and technical expertise.

The DFC is the Government's own ven-

ture capital outfit. In its six years of operation, the department has not been afraid of a roller coaster. The DFC has the cash, and for some time now has been looking for a genuine integrated New Zealand high technology product to back.

At first, the DFC tried to interest some of the larger New Zealand firms in taking over the development of the Polycorp. But they weren't interested, partly, one suspects, because they have their own microcomputer agencies: Fisher and Paykel has National Panasonic while Fletcher Challenge has just picked up Sord.

So in the event, the DFC decided to run with the Polycorp itself, putting in a senior man, Ian Coomb, to run the development. It seems fair to say that the Polycorp's error catalogue is still developing. It does not yet have the smooth nudging of the

pupil to the correct answer. But it seems also fair to say that nowhere else has anyone devised a true teacher substitute error catalogue. This will come.

Where the Polycorp really does excel is in graphics and here it has a unique feature which its backers hope will make it New Zealand's first substantial high technology export. There is now growing concern in all circles at the way in which the New Zealand electronics industry stays stalled downstream. Namely, manufacturing things like television sets, washing machines, and hi-fis. It would be far cheaper to import these things anyway. But the protected New Zealand manufacturers want to stay on high ground.

The Polycorp features an integrated four-screen overlay which delivers truly vivid graphics in up to eight colours. The overlay presents a high degree of movement capability for graphic projectiles. The hardware features simple cabling, only one set of disks per system. The system software features efficient and fast communication with the disk unit, automatic loading of system software, complete disinterfacing and management of programming languages.

Response time

The Polycorp features its own communication system specially devised to smooth the interface between the Poly console units and the system control unit. A simplified polling system determines the source of a message by the time it takes to send it. A remarkable aspect of the system is the condensed response time. My experience with the machine underlined just how interactive it is. The communications system automatically determines when units are switched on and off and adds or deletes them from the system.

The Polycorp has its own operating system POLYSYS. It goes something like this. When a Poly unit is switched on, POLYSYS determines if it is linked to the control unit. If it is, then the disc-interfacing sections of the operating system are automatically loaded from the disc and the menu comes up on the console units. If there's no link, then the unit still performs on standalone BASIC.

The whole system supports two programming languages, BASIC and Pascal. Both of these are based on commercial

versions with adaptations and extensions designed to make the most of the hardware. Significantly, there is full screen handling capability instead of merely line handling. At the same time, you can write to any part of the screen at any time.

Add 64K memory already on-board and you begin to see why even the standalone Polycorp is rather more than a humble computer-aided teaching device. With the screen-plus-background superimposition capability, the Polycorp has features going for it which a lot of microcomputers are still waiting for.

Look at this teletext presentation, for example:

- Upper and lower case
- Eight colours
- Reverse video
- Two types of chunky-style graphics with 72 lines of 80 pixels

The projectile motion makes Space Invaders seem tame in comparison. Take some of these projectile motions for example. There are seven programs in all made up of:

- Horizontal motion
- Vertical motion
- Free fall simulation
- Hit the tank
- Frames of reference
- Vector equations

The Polycorp seems to be particularly strong on geography land-use interactive teaching. In fact, I found the response time too fast for comfort. Then there is a computer awareness module of 10 programs which also covers word processing and optimum travel routes.

So where's the hitch? Why aren't the schools swinging into action with this extraordinarily well-developed and well-supported machine? There are several reasons.

The Polycorp needs complete blanket approval from the Education Department to go into the nation's 220 high schools. In other words, the machine needs blanket procurement by the Education Department for a classroom full of units in each of these schools.

The only identified market so far are the schools. It would be extremely hard for Polycorp Holdings to sell the machine on the market. The moment it leaves the classroom, it becomes liable to the 40 percent. The only computers exempt from the

punitive sales tax are the ones bought by the government. So, as the machine draws close the \$5000 mark, it ceases to be so competitive with the other micros.

Then there is the Microcomputer Industry Association, which is not exactly overjoyed at the intervention of the state into their domain. Even so, Frank Ollie, Managing Director of David Reid Data Products, the overwhelming market leader here with the nationwide Radio Shack franchise, says he sees no competition from the Polycorp and doubts whether it will really be suitable even in the classroom. He recommends programmed books, at this stage.

David Reid Data Products, meanwhile, has taken a solid grip on the schools market through a slick bulk procurement deal arranged through Birkdale College, Auckland, for a nationwide discount scheme.

Political tide

At this stage, it would probably suit the Polycorp promoters if a Labour Government were elected in November. A Labour Government, of course, would not be so squeamish about offending the private sector. And it would see the Polycorp as an important semi-nationalised venture into high technology.

However, the biggest beneficiary of the Polycorp development would be the New Zealand software industry, which under Polycorp would have a continuing demand into the foreseeable future. The main software contractor at this stage is the remarkable Progeni company of Lower Hutt which now appears to be the largest software house in Australasia, with offices in Los Angeles and Sydney.

The pot of gold at the end of the Polycorp rainbow is really a busy export market, with squads of New Zealand-based programmers roaming the high schools of the world servicing the Polycorps.

But as far as Polycorp is concerned, there is Big Bad Giant who threatens to trample all over it. Control Data is mounting a frenzied and massive lobby here to persuade the government to go the Plato way. So the Polycorp picture now is literally one of suspended animation. Until the Minister of Education signs the bulk procurement, it will never get beyond the test bench.



TEXAS INSTRUMENTS TI-99/4

THE TEXAS Instruments 99/4 home computer is based on the powerful 9900 microprocessor family.

This uses a 16-bit word instead of the usual eight bits, giving the 99/4 a potential performance advantage. Other special features include dynamic string variables of up to 255 characters; three dimensional arrays of numbers and strings; variable names of up to 15 characters; and English language error messages.

The computer is powerful. It has 26K of ROM (read only memory) split into 14K devoted to TI BASIC, while the remainder is used for sound and graphics control. Also built in is 16K of RAM (read/write memory), which can be expanded up to 48K.

The 35cm colour monitor can also be used as a colour television; and the computer has a colour display, which changes colour while operating, adding to the impact of the unit.

The time required to install a new machine is minimal. Just plug it in (the instructions are very clear), and turn the power on. Then you can quickly learn how to use the computer by following the very informative training manual supplied. By plugging in a specialised command Module (which is an additional ROM pack) you can enjoy the games, or set up financial models and mailing lists.

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your computer REVIEW

Overall the unit is simple to set up, easy to operate, and has a wide (and ever increasing) range of supporting equipment and programs.

The Plus Side

TI BASIC is based on ANSI BASIC, with the usual commands and statements. Some of these are more powerful than is usual. For example, DEF(ine) works with both letters and words, and you can nominate the word to follow DEF.

A very useful control is the user's ability to readily change the shape and position of any character. You can even assign an ASCII code and any one of 16 colours to the character (plus another for the background), all in one statement.

The machine has built-in sound and music facilities. These can cover five octaves, with three simultaneous tunes and a noise generator anywhere in the range from 110Hz to 40,000+ Hz. As before, a single statement can create any sound, note or chord. These are very useful features if you are writing programs for use by children.

A couple of months ago, we briefly discussed the TI-99/4 home computer, but didn't have the opportunity to put it through its paces. Now here's a comprehensive run-down, by an experienced user — SHANE ANDERSEN, of the 99/4 Users Group...

The editing features are very good. At the press of a preset button, you can have AUTO(matic) line numbering, starting at a user-selectable number with pre-determined increments. Then you can readily re-number the program, and this will re-number any branch instructions.

It is easy to insert or change a line, and debugging facilities include TRACE, a very flexible BREAKPOINT facility, CONTINUE, UNBREAK AND UNTRACE.

And Drawbacks

While the TI 99/4 has many strengths, it is not perfect.

While the weaknesses are relatively minor, they include the delays in getting to the end of a long line if you want to make a correction. There is no alternative to developing a fast reflex tap in your ring finger. Moreover, you cannot delete a block of line numbers.

The strength of the TI graphics is also a weakness. You cannot easily get HI(gh) RES(olution) plotting (for example, of a sine curve) without writing a complex little program. This weakness is not unique to the TI, however.

Bench tests show the TI to be slower than average, but this is not critical in a home computer. And Assembly language is not available to users. This is not a major weakness as Assembler is usually

used for graphics, and the machine has good graphics built into BASIC. These are even better when the Extended BASIC Command Module is plugged in.

The machine is oriented towards the home user. Hence the high quality colour and sound systems. There are many business applications, especially in decision-making, data analysis and personal record keeping.

However, there are few programs available for business applications, such as order entry, debtors, creditors, general ledger or word processing.

The Module Transforms

The Extended BASIC module transforms the 99/4 from a very good home computer to the best available.

Imagine having control over 28 objects, called 'sprites', capable of moving at any speed, in any direction, and any shape, any colour, any size you want. And furthermore, being able to change any of their features, all in BASIC. And that's just the sprites...

The BASIC commands and statements are also mightily expanded. There are FORTRAN-like subroutines (callable by name) and logical operators (including XOR), which return the decimal equivalent of the result of the binary operation on the original numbers.

The difficulty in relocating blocks of instructions is partially solved (by the shift R key), there are MIN and MAX functions, and the flexibility of the IF..THEN..ELSE statement is mind wrenching. (*I hope not — ED.*)

The Extended BASIC module is only one of the many snap-in command Modules available.

Personal Favourite

There are many extras available for the TI 99/4. My personal favourite is the RS-232C Interface. Plug it in and you can talk to other 99/4's (also other brands of computers).

Its best application is talking to communications systems, such as MIDAS (OTC's trans-Pacific data link), Texnet (a TI Biggy), The Source, and electronic mail systems, through a modem. The RS-232C interface also allows you to use other makes of printers, plotters, terminals, digital/analogue converters, data tablets and diskette units.

Alternatively, you can use TI's own disk-drives and controller, modem or telephone coupler, printer, remote controllers, or joysticks.

Another feature is the Speech Synthesizer, which simply plugs into the side of the computer, and enables the 99/4 to speak, in a very clear voice. This is a fantastic teaching aid, for both children and adults.

A wide range of Command Modules

(which simply slot into the computer) are available, and more are being developed. Educational modules include beginning grammar, early learning fun, early reading (with voice) and number magic.

Home and small business modules include personal record keeping, statistics, securities analysis and terminal emulator.

Most of the fun in having a home computer is in games such as Hunt the Wumpus, A-maze-ing, Indoor Soccer and Music Maker. Oh, almost forgot the big one — the 99/4 Chess Module, designed by international master David Levy.

We know a few people who bought the 99/4 just for the many functions of the

Chess Module alone. It will help you if asked, allows you to replay the game, or even change your moves, and you can just use it as a board, to play another human.

The TI 99/4 user's groups around Australia supply free club software on cassettes to members, like Invasion from Space, Enemy Attack, and Engineering. In fact, this unit can use two cassettes — one for loading and one for saving, if you wish.

Canberra Television Services is the distributor of the TI 99/4 in Australia, and sells the computer and colour television monitor for \$999. □

Specifications and Report Card

Unit:	TI-99/4
Made By:	Texas Instruments Incorporated
Processor:	9940
RAM:	16 Kbytes
ROM:	24 Kbytes
I/O:	Cassette interface, expansion port
Languages:	BASIC, Pascal, LOGO
Keyboard:	QWERTY, strange feel
Display:	32 × 24,
Graphics:	256 × 192
Peripherals:	Disk drives, printer, speech synthesizer
Expansion:	6 Extra RAM, ROM modules
Best Points:	Excellent documentation for beginner
Worst Points:	TI's go-it-alone approach

Ratings:	excellent	good	well, maybe	poor
Documentation	✓			
Ease of Use		✓		
Functionality			✓	
Support				✓
Value-for-money			✓	
Extras included:	NA			
Options:	Solid-state software command modules			
Price:	\$999			
Review unit from:	Shane Andersen			



Yep, he had the right type of beard! John Forshaw (in the suit) of Camberwell, Victoria, was the winner of our APF Imagination Machine competition. He received his prize from Allen Feiglin (in the hat), of Calculator Supermarket.

Wordplex WA

WHEN THE management services officers of Western Australia's Department of Education decided to investigate word processing, they took their learning task very seriously.

Initially, they had considered word processing mainly as a means to speed up the preparation of the Department's budget. However, with a total of 160 typists on staff, the officers decided to look at a more integrated approach.

"In the short term, we had to ascertain if word processing was economical, viable, and suitable for our immediate needs," Management Services Officer, Brian Lucas, said. "However, it also had to be flexible enough to cater for our long term needs, particularly as the department had planned a change of buildings."

A preliminary survey showed the number of women employed, their locations, and the types of jobs performed. Seven separate geographical and functional areas were identified and one of these, the head office area, was then selected for a full survey.

"Once we had established

that word processing could be installed successfully, we wanted to ensure we bought a system which gave us maximum flexibility. In particular, we were interested in a shared logic system," Mr Lucas said.

The department finally selected three Wordplex/2 and one Wordplex/4 word processors, and four screens from Sigma Data, saying it was also relying on the company's assurances regarding support facilities for the equipment.

"The Wordplex equipment seemed pretty flexible to us," Mr Lucas, said. "It had large storage which could be expanded easily, it was simple to plug in and plug out, and would enable us to consolidate installations at a later stage."

900 LPM Printer

A NEW microprocessor-controlled 900 lines-per-minute band printer, from BDS Corporation, incorporates diagnostic routines and a dual-digit status display.

This allows operators to pinpoint and correct minor problems, eliminating most "no-trouble-found" service calls. The display also indi-

cates malfunctions such as character-read errors, vertical format unit faults and others that guide maintenance personnel.

The BDS 900 132-column printer operates at 1100 lpm with a 48-character set, 900 lpm with a 64-character set, and 672 lpm with a 96-character set. Bands are easily exchanged by the operator.

Horizontal print format is ten characters-per-inch (3.93 ch/cm), with vertical format switch selectable at six or eight lines per inch (2.36 or 3.14 l/cm). Vertical format is controlled either by a 12-channel VFU or via program control.

Paper slew speed is 5.9 cm/sec, with a maximum single line advance time of 18 cm/sec. Band speed is 66cm/sec.

The new printer is complemented by BDS' plug-compatible line of interfaces and controllers, for computers manufactured by Digital Equipment, Data General, Hewlett-Packard, IBM, Interdata, Burroughs and Control Data.

Anadex Printers

ANADEX INC, one of the fastest growing manufacturers of small business/industrial system printers in the USA, introduced three new printers at the recent NCC show in Chicago.

Following their DP-9500 series line printers, the three new products offer the user dramatic new features.

Model WP-6000 is a dual mode printer producing both high speed draft and correspondence quality serial dot matrix printing.

In correspondence quality mode, the printer is capable of 150 cps and employs a new 18 needle print head.

Graphics capability is incorporated as a standard feature, providing resolution of 144 dots/inch in both vertical and horizontal axis.

The second new printer is an interactive printing terminal — the DP-9620 KSR, featuring a 40 character single line vacuum fluorescent display, allowing message editing and composition prior to transmission.

An 80-key alphanumeric keyboard is included with optional 16-key numeric keypad and additional buffer storage to 4.6 K.

The DP-9610 RO is a receive only high speed printer version of the DP-9620 KSR, capable of 200 cps and able to print in eight different pitches (10 - 16 cpi).

Standard buffer is 600 character FIFO, with optional 2 K or 4 K add-on buffers available.

Rob Stirling and Steve Chapman from Bell & Howell's Electronics and Instrumentation Division, the local distributors of Anadex, both attended the Chicago show as part of the Anadex sales team, and reported that business was brisk on the stand.

"These new products are expected to be available in Australia in the first quarter of 1982," Mr Chapman said.

Canberra Agent

3M AUSTRALIA has appointed Canberra firm Boulevard Business Services as an authorised distributor of Scotch brand data recording products. 3M is completing a national network of 45 distributors to service smaller, direct clients, and to establish new business.

Boulevard Business Services' general manager Mr Stuart Ritchie, who has worked in the computer industry for 17 years, says Canberra's computer media market is growing strongly, with government departments spending millions of dollars each year on computer media bought directly from the manufacturer.

Teleray Offer

BLOCK MODE and full editing capabilities are two of the ten new standard features included in the Teleray 100 series of CRT terminals, now available in Australia.

The new features, including the choice of black and white or green screens, are available at no extra cost from Australian and NZ distributor, Anderson Digital Equipment. ADE says the increased costs of the additional features have been absorbed to keep the price of the popular 100 series at competitive levels.

Other new features include half-duplex (in addition to full) communications; forms transmit; protect mode (with a protect attribute independent of the six 'hidden' display attributes) and the ability to execute or transmit user-programmable functions when on-line. □

Aussies' Breakthrough

AN AUSTRALIAN software company has broken into the American computer market.

The company IMS computer Systems, of Melbourne, has opened an office in Anaheim, California, to

service its American launch.

Already the company has the support there of one of the world's big three microcomputer manufacturers. Initial sales are anticipated in excess of \$500,000.

IMS managing director Mr Brian Gardiner told *Your Computer* the US deal was made when he visited the Pennsylvania headquarters of Commodore computers.

He is currently in America planning a second IMS office in Dallas, Texas.

He said: "Commodore said our programs were as good as any they had seen, and agreed to market them on the proviso that we made some small local modifications and gave them marketing support in America.

"We immediately set up our Anaheim office and sent two programmers, Ms Pam Wheeler and Mr Laurie Devine to join it," Mr Gardiner said.

"Commodore will train an American IMS staff to write, enhance, and maintain our Australian programs."

The IMS programs were specifically written for Commodore in Australia, for use

on the CBM 8032 microcomputer. The programs are designed to cover all the work essential to small business accounting systems.

"Selling for \$US295 per module, they are pitched about \$US25 below competing systems in America," Mr Gardiner said.

Commodore's Australian managing director, Mr Nigel Shepherd, said in Sydney recently: "Most of our Australian programs are well thought of overseas. It's only in Australia that they are often underestimated." □

Jobcost Package

DATAFLEX Services, a Brisbane-based company providing computer consulting services to small business operations, has developed and released a job-costing system.

The firm claims the system will bring computerisation within the reach of a new small business market, previously untapped because of the current high price of similar systems.

Called Jobcost III, the system is priced at under \$12,000 — a third or half the

price of comparable systems available — according to Mr Serge Petelin, managing director of Dataflex, and responsible for development of the program.

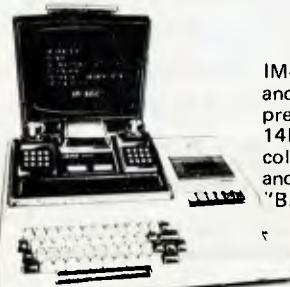
Jobcost III took 12 months to develop. It is designed to provide a job costing and cost estimating system which would operate effectively in any business which needs to cost a manufactured or assembled product.

After five months test with Marlin Modular Constructions, a Brisbane manufacturer of pre-fabricated buildings, Dataflex began marketing the package in October, through TCG Ohio Scientific agents in Brisbane and the Eastern states.

The software is designed to run on Ohio Scientific hardware C4PDF, C8PDF or C3 with dual floppies and a polled keyboard or serial terminal. It will also support without modification Microline 80 or Epson MX80 printers.

"Ohio Scientific was chosen because of the support utilities of other programs which provide facilities such as sorting files and inserting records," Mt Petelin said. □

The Imagination Machine



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Teacher, Teacher

TANDY Electronics has announced a \$23,000 sale of TRS-80 microcomputer systems and accessories to Polding teachers college, of N.S.W.

The college has introduced two new special study courses in a classroom devoted to 16 TRS-80 Model III microcomputers, all bridged by a Network II controller to a single 48K twin-drive Model III and line printer VI.

Brother Anthony D'Arbon, vice principal of Polding College, explained: "We have always believed that our students should learn on equipment that is going to be used in schools where they will one day be teaching."

According to Br D'Arbon, the new courses have three main aims. First, to help fu-

ture teachers in the state's catholic school system gain an understanding of computer programming.

Second, this understanding can then be applied to the construction of programmes which, third, can aid tomorrow's teachers in instructional and/or learning situations.

All Polding students training to be Mathematics and Science teachers will gain expertise in the use of computers and their applications in the classroom through the new programme.

Additionally, all students including those specialising in primary and secondary schools, will be given the opportunity to familiarise themselves with the educational applications of microcomputers. □

No-frills Language

CL SYSTEMS a relatively new company on the computer software market, has commenced to actively market a new, non-procedural computer language—CL-1.

Described as an application generator, CL-1 is an all-Australian product. It is believed to be a world first in software development—unlimited commercial applications can be developed, maintained, tested and documented by personnel without formal programming skills.

After a full 15 months of operation, CL Systems have developed a creative stance, designed to generate a direct response for their CL-1 product.

CL Systems, based in Melbourne, aims to establish itself as a unique software specialist not with individual programs to offer, but with an application generator, from which unlimited applications can be developed, often without the need for expensive, highly trained computer programmers.

The company is presenting CL-1 as a simple business terminology that can be understood by everyone—and that avoids any possible confusion of CL-1 with any other software product.

Trade advertising for CL-1 will centre on its specific features and benefits, expressed in humorous non-computer terminology.

Further enquiries to CL Systems Ltd, 457 St. Kilda Rd, Melb. Phone 267 6822 □

CYBERNETICS RESEARCH

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YC 6

Market Approach

COMPUTER WAVE, based inside Myer's Sydney store, has chosen to sell to people who would have had no previous experience with computers, to introduce the computer to first-time users.

The biggest problem in marketing small computers, both for home and small business, is to overcome the buyer's fear — a fear of the unknown, the strange, the new, says Computer Wave's Bernhard Kirschner.

The more familiar the environment, the easier to overcome the fear. To this end, Computer Wave has approached the microcomputer market in a very different way to the conventional computer store, he says.

Computer Wave has opened in an environment that is familiar to the public, and offering the usual shopper's facilities, like credit accounts, credit notes, delivery and the facility for browsing.

The store is designed to look friendly, with specially designed furniture that encourages visitors to touch the machines — no gleaming modernistic chrome — just simple wood in a 'friendly' environment. No racks of intimidating manuals.

"It is no more necessary to know how to fix your car in order to drive it than to know how to program to operate a computer. Sure programming is fun and challenging, but not necessary to enjoy and use a computer," Kirschner explains.

"There are both male and female sales staff, and although they come from different backgrounds they are thoroughly trained in how to use and enjoy computers. Our biggest staff problem is to get them to go home at night!" he says.

Sales staff are encouraged to talk to shoppers in normal English, and not to

confuse customers by displaying their knowledge of computers. Their job is to explain and show to customers what computers can do for them."

There is a wide choice of computers on display, including Apple, Atari, Commodore, Texas Instruments, VIC and Sinclair, as well as depth of stock.

The hobbyist and specialist programmer have not been forgotten. Besides having programming and technical manuals with specialist programming software, there are specialists on hand who can answer most questions, especially on the Atari, which is a newer machine. □

Plugs In

A COMPUTER is quietly helping to speed up the emergency breakdown service for NRMA members in Sydney.

The computer is the heart of the NRMA's new dispatch system, which also includes a special phone network and ultra-high frequency radio channels. The new system accelerates the recording of members' calls and provides improved logistical information to help plan Road Service for the next few hours, or longer.

When there are more calls than the number of phone receptionists on duty, the extra calls are stored by the computer and automatically allocated as soon as a job is passed to the dispatch clerks. It can handle up to 1000 calls an hour.

A computer video display unit can also continually update information on each road service region. A video display screen shows a print-out of the number of members waiting for service, the number of patrolmen working, the estimated time for each job and how many jobs were completed in the previous hour. □

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Micro Real Estate

THE REAL Estate Institute of Australia is surveying the availability and range of micro and mini computers with application to small and medium-sized real estate agencies.

The results of the survey will be published for distribution to members of affiliated real estate institutes throughout Australia.

The Institute is particularly interested in systems with applications in such areas as property management, property listing, sales analyses, valuation, buyer listing, buyer/seller matching, business brokerage and buyer/seller mailouts.

It envisages the complete cost of suitable systems being in the \$5000 to \$25000 range.

Suppliers with systems and application packages suited to the needs of the real estate industry should ask The Real Estate Institute of Australia for a computer survey questionnaire. The address is PO. Box 292, Civic Square, ACT 2608. Phone: (062) 4775533. □

Ergonomic 8600

DATAPPOINT has introduced its new 8600, the first in a new family of processors and workstations designed with ergonomic features.

Also new from Datapoint is a compact 20MB disk system, using 13 cm (5.25 inch) fixed disks, and an integral 20MB cartridge streaming tape drive.

The 8600 features a large amber screen, a powerful central processor, and a

memory capacity of up to 256K bytes. It is fully compatible with Datapoint's ARC (Attached Resource Computer) local network, and can also be used as a stand-alone system.

The 9301 disk unit, a high technology fixed media mini disk system, uses a special thin film disk and can store 20 million bytes. Extension units for the 9301 are available to give the 8600 a maximum storage capacity of 100 MB□

Customer Needs

AUTHORISED Apple hardware and related software agent Moebius Computer Co, of Roseville, Sydney, aims to help people overcome their problems in computer related areas, a spokesman John Hall advised Your Computer recently.

The firm aims to bring together experts who are competent to advise customers, and to write programs to suit their needs.

Comprehensive advice will be coupled with the best after sales service possible, according to Mr Hall.

He went on to point out that much of the publicity given in recent times has emphasised the efficient nature of computers. The emphasis being on their presence worsening unemployment.

"It would be more to the point to show that those who are computer familiar in the next generation will have the greatest chance of gaining employment," he wrote.

"Computers are becoming a tool. They are becoming more accessible as they become cheaper and easier to operate," Mr Hall said. □

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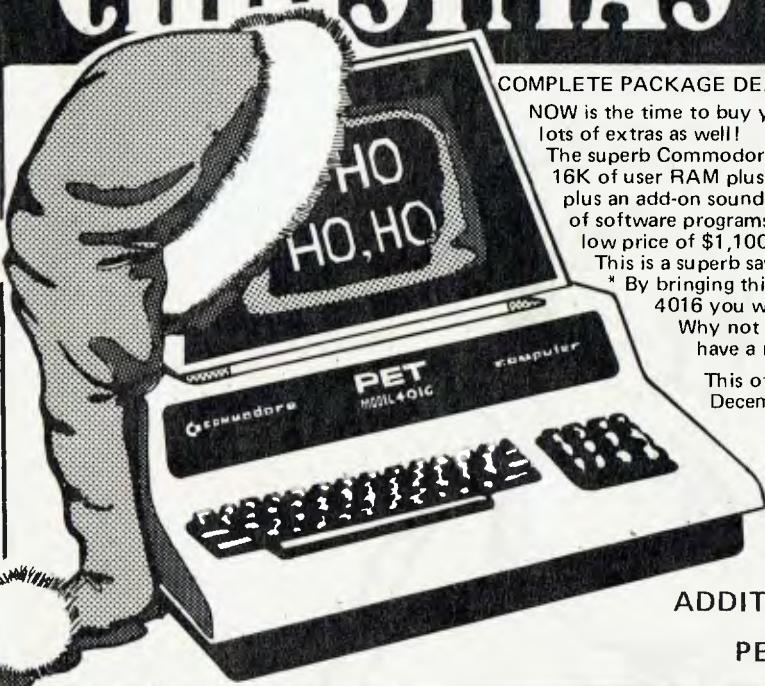
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The Wordcraft Data Base was primarily designed for the Wordcraft Word Processing user to allow access to a simple, flexible data base system. The system allows the storage of names and addresses, lists of various types, book directories, or in fact, any collection of information that can be broken down into groups or fields of common information.

Wordcraft Data Base is a menu driven system which simply means that after completion of a given task the system returns to the menu.

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Binary for Beginners

Part 00000010



In the first part of this article LES BELL explained how computers count in binary. What he didn't explain is what happens when you subtract 3 from 2, giving -1...

LAST MONTH we covered what probably felt like every conceivable method of counting and representing numbers. Unfortunately, it wasn't. Consider this problem. Into the accumulator of our eight-bit microprocessor, we load the number 2. Remember, in binary, that will be 00000010. Then we subtract 3 (00000011). What will the answer be?

The answer we want is -1. The answer we get is 11111111. Converting this into decimal, we find that $2 - 3 = 255$. Can this be right?

It sure is! This way of counting is called 'two's complement representation'. What we have to do is adjust our way of thinking. Let's look at it this way:

If the most significant (i.e. left-hand) bit of a number is set to one, then that number is negative. If it's a zero, however, then the number is either positive or zero. So if -1 is 11111111, then -2 is 11111110, -3 is 11111101, and so right down to -128, which is 10000000. Note that we can now count from -128 up to 127, which is the highest number we can represent using eight bits of two's complement. With 16 bits, we can go from -32768 to 32767, and that's the way that most Tiny BASICs, C compilers and so on do their counting.

This numbering scheme has several advantages. First of all, zero is still 0 (00000000). So our assembly language J (jump on zero) and similar instructions will

still work. Secondly, if we add 1 to -1, using conventional binary addition, we still get 0, and conventional binary arithmetic will still work, as we saw with the $2 - 3$ example. We just have to remember that 255 isn't really 255, in fact it's -1.

Converting a number into its 'two's complement' number is easy. Positive numbers and zero are OK anyway; they stay the same. To work out what -7 is, i.e. the two's complement of 7, follow the following steps:

Write the number out in binary, i.e. 00000111, then invert the number, that is make 1's into zeros and zeros into 1's, i.e. 11111000. This gives you the one's complement of the original number. Now add

one to this result, i.e. 11111001, and the result is the two's complement representation of -7. This will work for any number.

BCD

We haven't finished there, either. Another way of storing numbers is in what's called Binary Coded Decimal (BCD) format. In this variation, each four-bit part of a byte or a word is treated as a separate decimal digit. So to encode the number 6473 into a 16-bit word, it would be done this way:

0110 0100 0111 011
6 4 7 3

With BCD numbers, ordinary binary arithmetic won't work. However, most microprocessors have a Decimal Accumulator Adjust or similar instruction, which fixes up the wrong answer that results from adding two BCD numbers. The exact operation of this instruction depends upon the processor, and you should check the manual for details.

There are other ways of representing numbers in binary, such as XS-11, but enough's enough — and we've covered the most important ones.

Floating Point — Really?

If you've read all this, you're probably wondering why, if all these one's and zeros limit you to numbers between -32768 and 32767, does your BASIC give you answers with 14 digits of precision, and numbers as high as the number of atoms in the universe?

The answer is that BASIC interpreters and other languages often work with what are called **real numbers**. These are expressed internally in a format that lets them represent very large or small numbers with a certain degree of accuracy. Here's how it works:

If you had a very large number to store, such as 1,000,000,000 then that would exceed our binary system's capabilities. Suppose also, that we want just six digits of accuracy, and that any more is pointless (as it often is in engineering or scientific calculations).

Why don't we just store the first 6 digits (100000) together with a second number that tells us where to put the decimal point? If we're really clever about it, we can still calculate with these numbers, although our computer will have to work a lot harder to keep its sums right. In this case, the decimal point is nine digits to the right of the first digit.

In computer talk, this number is written 1.00000E9, although the point in the number isn't the real decimal point (which should be nine places to the right). Instead, it's a floating point. In a floating point number, the floating point always comes right after the first digit, and there's another number, called the **exponent** (hence the E) which states how many places to right we have to move the point to put it in its real place.

Notice some interesting things about floating point numbers. If we add 15 to 1.00000E9, the sum looks like this, with the significant digits (i.e. the ones the computer keeps) shown in bold:

$$\begin{array}{r} \mathbf{1} \, 000 \, 000 \, 000.000 \, 0 \\ + 0 \, 000 \, 000 \, 015.\mathbf{0000} \\ \hline \mathbf{1} \, 000 \, 000 \, 015.000 \, 0 \end{array}$$

The answer, as the computer keeps it, is therefore 1.00000E9 again, which is, of course, inaccurate. This means that arithmetic done with real numbers is often inaccurate, in just the same way that $1/3 \times 3$ can have surprising effects on pocket calculators.

Inside the computer, floating point numbers can be represented in various different ways, although the Institution of Electrical and Electronic Engineers is proposing a standard. Generally, although in the example above I showed the decimal point being moved around, computer systems represent floats as binary numbers with a floating **binary** point. In fact, the point isn't stored in any case, since it is always in the same place and would just waste space. Furthermore, the exponent is stored in binary as well.

A variant on this system is often used in systems which are used for commercial transactions. Here, the numbers represent money, and inaccuracies cannot be allowed. In such systems, like CBASIC for example, numbers are represented as 14 digit BCD numbers with a binary exponent. This gives increased accuracy, but at the price of very much decreased speed.

That concludes our guided tour around the world of binary numbers. By now you should be able to count in binary with the best of them!



your computer pocket programs

Menu For System 80

SYSTEM 80 user Joe Taylor, of Churchill, Victoria has submitted this 'menu' program for 16K Level II System 80 users.

The BASIC and Assembly Language listings are included. As long as the area of memory is protected by entering '31000' on power up (after the prompt 'READY?') the BASIC program can then be wiped and a new program entered via the keyboard or cassette (31000 is only a convenient number to remember, if memory is short then, 31487 can be used to gain the extra 487 bytes). Readers could probably find many uses for this program, writes Taylor. Its advantages are:

Speed; it allows the re-drawing of the original screen almost instantaneously.

Background; if used within a loop, it can be used to superimpose a background to whatever the loop is drawing. (If used too frequently, it will result in flickering).

Any Reader who spends a lot of time writing games programs for the kids should be able to find a few uses for this menu.

BASIC LIST

```
10 REM 31000 ON POWER UP
20 POKE 16526,0: POKE 16527,123: REM BOOH
30 REM A=USR(0) TO SAVE ORIGINAL SCREEN
40 REM A=USR(1) TO COPY ORIGINAL SCREEN
50 FOR X=31488 TO 31519
60 READ A
70 POKE X,A
80 NEXT X
90 DATA 205,127,10,125,254,0,32,12,33,255,63,17,255,127,1,0
100 DATA 4,237,184,201,33,255,127,17,255,63,1,0,4,237,184,201
```

ASSEMBLY LANGUAGE LIST

```
100    ORG 7B00H      ;ORG 31488 DECIMAL
110    START CALL 0A7FH   ;FETCH HL
120    LD A,L           ;TEST FOR
130    CP 0              ; ZERO
140    JR NZ,COPY       ;JUMP IF NON-ZERO
150    SAVE LD HL,3FFFH   ;END OF SCREEN
160    LD DE,7FFFH       ;END OF 16K MEMORY
170    LD BC,400H        ;NUMBER OF SCREEN BYTES
180    LDDR              ;BLOCK TRANSFER
190    RET                ;RETURN TO BASIC
200    COPY LD HL,7FFFH   ;END OF 16K MEMORY
210    LD DE,3FFFH       ;END OF SCREEN
220    LD BC,400H        ;NUMBER OF BYTES IN SCREEN
230    LDDR              ;BLOCK TRANSFER WITH DEC.
240    RET                ;RETURN TO BASIC
```

After the CALL OATFH has been executed the value in parentheses in the BASIC statement A=USR(X) is loaded into the HL Register Pair.

The LD A,L
CP 0
JR NZ,COPY

Tests if this value is zero or non-zero.
If zero it falls through to the 'SAVE' routine
If non-zero it branches to the 'COPY' routine

HOW IT WORKS

To use this program in any subsequent program (or as a direct command) it is necessary to repeat the statement in line 20 (POKE 16526,0:POKE 16527,123) to set the pointer to the beginning of the machine language program. After this has been done at the start of the program then the screen can be 'memorised' by using the statement

A=USR(0)

and can be copied at any stage (or stages) by using any value that is non-zero in parentheses.

i.e. A=USR(1)

The following is a simple example of its use:

```
10 POKE 16526,0 : POKE 16527,123
20 CLS: REM DRAW INITIAL SCREEN
30 FOR X=0 TO 1023
40 PRINT@X,CHR$(191);
50 NEXT X
60 A=USR(0) : REM SAVE SCREEN
70 CLS
80 PRINT@450,"ANY KEY WILL MAKE THE SCREEN 'BLINK'
TEN TIMES"
90 A$=INKEY$ : IF A$="" THEN 90
100 FOR Y=0 TO 9
110 A=USR(1) : REM COPY SCREEN
120 FOR W=0 TO 200 : NEXT W : REM TIME DELAY
130 CLS
140 FOR W=0 TO 200 : NEXT W : REM TIME DELAY
150 NEXT Y
160 END
```

Remember

A=USR(X)

can be used as a direct command. For example when writing a long program in basic it may be necessary to refer back to a section of the program several times to obtain line Numbers Etc. If a listing of the relevant section is on the screen the screen can then be saved using:=

A=USR (0) (ENTER)

and can be recalled at any stage by typing:=

A=USR (1) (ENTER)

This means you don't have to remember the relevant line Numbers as they are in memory. □

Renumber Version 8.9 Algorithm

```

REQUEST (START);
REQUEST (INCR);
IF INCR = 0 THEN ERROR
OUTER <-- TOP OF PROG
TARGET <-- START
WHILE      OUTER <> END OF PROG DO BEGIN
            CURRENT <-- OUTER (LINE NUMBER)
            DIFF <-- TARGET - CURRENT
            INNER <-- TOP OF PROG
            WHILE INNER <> END OF PROG DO BEGIN
                IF INNER(LINE NUMBER) >= CURRENT THEN
                    INNER(LINE NUMBER) <-- INNER(LINE NUMBER)+DIFF
                    SEARCH LINE FOR LINE NUMBERS, FOR EACH ONE
                    IF NUM>=CURRENT THEN NUM <-- NUM+DIFF
                    INNER <-- INNER(NEXT POINTER)
                END WHILE
                OUTER <-- OUTER(NEXT POINTER)
                TARGET <-- TARGET + INCR
            END WHILE
END RENUM

```

**It Just Slipped Out,
Honest**

Those of you who follow pocket programs in Your Computer will have noticed that in the November issue that figure 1, the algorithm mentioned was missing. Oops!

You won't believe how sorry the publisher has made us for this omission, and we hope to make it up by printing the deleted section in this issue.

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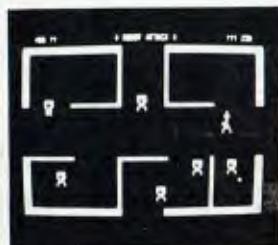
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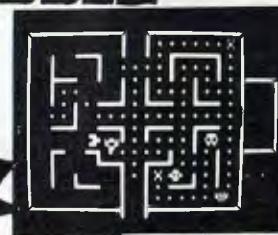


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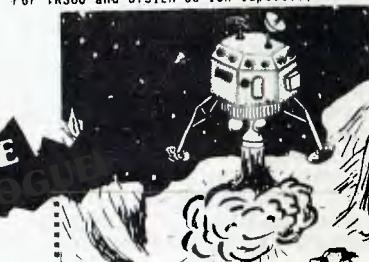
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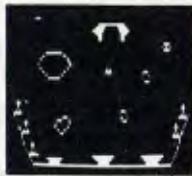
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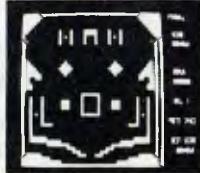
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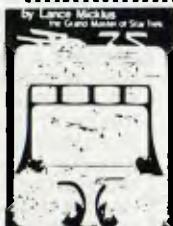
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your ZX80 computer

IN THE electronics magazines of two or three years ago, I noticed a sudden flood of advertisements offering "Home Computers" and "Micro-computers". Having had a nodding acquaintance with various types of computer through my Air Force career, the thought of owning my own instantly had my imagination in fast mode, and I began a psychological warfare campaign on my wife aimed at buying one as soon as possible.

I finally overcame all resistance a few months ago, and obeying both the dictates of finance and my instincts as an ex-Pom, I became the owner/slave of a Sinclair ZX80. A full technical review of this machine was published in the May/June issue of *Your Computer*, so in this article I will concentrate on what can and cannot be done with it, plus a few tips and ideas which you may find handy.

One of the greatest problems I have found while writing programs is the ZX80's endearing habit of not letting you know, in any formal way, that you are running out of RAM. There you are, happily typing away, when suddenly, instead of characters appearing on the screen, they start to disappear as your computer eats its program. Once that happens, you may as well pull the plug. There is no way you will get back in control at that stage.

However, if you watch closely, the ZX80 does hint that RAM is nearly full. Instead of using all the screen to list the developing program, it starts to list only the last couple of accepted lines, at the top of the screen. That is your first warning. Shortly after that happens, you will notice that the cursor, instead of appearing at the bottom of the screen, is just below the last accepted line. Be warned — you are pushing your luck.

When I get the first warning, I do a "dump" onto cassette. Even though the program is not finished, SAVE it. This will save you a lot of trouble later if, despite the warnings, you still try to overfill RAM and lose the lot. You simply LOAD back off cassette and start tailoring your program to fit. PRINT statements are the biggest memory-eaters, so keep them to a minimum. If you can get the message across in four words, don't use six just for effect.

For example:

10 PRINT "NL"

will get the message through just as well as:

10 PRINT "PRESS NEW LINE TO CONTINUE"

and uses eleven times less memory.

Cutting down your PRINT statements will also help at those times when you attempt to RUN a program, and it hangs up with the error signal:

4/xxx

which is "no room to add new variable/line number (xxx)"

Keeping PRINT statements brief and making maximum use of IF...THEN GOTO... commands, it is quite amazing how complex programs can become. One of the first programs I wrote was "MISSILE SILO", which presents the target, an enemy missile, approaching at a random range from a random bearing. Your defensive silo is aimed, also at random, at some other point of the compass. You must enter the difference between the two headings and bring your silo to bear, whereupon your anti-missile will fire automatically.

The display then switches to a "status report", giving range to your missile and the incoming missile. Don't think you have won at this stage, though. You may hit your target, or enemy electronic counter-measures may jam your missile. Even if you hit it, radiation may still reach your position and cause casualties. After the initial phase of firing the missile the program only requires the user to press NEWLINE for each screen update, and if this is done once or twice per second it can almost simulate a real-time situation.

By the way, line 40
(LET R=RND(30)*200/100)

ensures that the random range is always an even number. This is necessary because your missile, once it is fired, will recede from you at a rate of two units each time NEWLINE is pressed, and the incoming missile approaches at the same rate. Good hunting! □

1K ZX-80

```
10 LET F=RND(15)
20 LET B=RND(260)
30 LET C=RND(100)
40 LET R=RND(30)*200/100
50 LET S=RND(360)
60 CLS
70 PRINT "RANGE ";R;" MILES"
80 PRINT "BEARING ";B;" DEGREES"
90 PRINT "SILO IS AIMED
ON ";S;" DEGREES"
100 IF R>0 THEN PRINT "TRAVERSE"
110 IF R<0 THEN PRINT "ENEMY MISSILE
IMPACT. CASUALTIES ARE ";C;" PERCENT"
120 IF R<0 THEN STOP
130 INPUT T
140 LET R=R-2
150 IF S>B THEN LET S=S+T
160 IF S>B THEN LET S=S-T
170 IF NOT S=B THEN GOTO 60
180 IF S=B THEN PRINT "FIRE"
190 PRINT
200 PRINT "PRESS NEWLINE TO TRACK YOUR
MISSILE"
210 LET M=2
220 INPUT T$
230 LET R=R-2
240 LET M=M+2
250 CLS
260 PRINT "RANGE TO YOUR
MISSILE ";M;" MILES"
270 PRINT
280 PRINT "RANGE TO INCOMING
MISSILE ";R;" MILES"
290 IF M=R THEN PRINT
300 IF M=R THEN PRINT "MISSILE DESTROYED
AT ";M;" MILES, LETHAL FALLOUT
COVERS ";F;" MILES"
310 IF R=M AND F>M THEN PRINT "NO
CASUALTIES"
320 IF R=M AND F>M THEN PRINT "CASUALTIES
ARE ";C;" PERCENT"
330 IF R<0 THEN GOTO 110
340 IF M>R THEN PRINT "ENEMY E.C.M. YOUR
MISSILE FAILED TO EXPLODE"
350 IF M>R THEN GOTO 220
360 IF R>M THEN GOTO 220
```

JOHN BATTY

your CP/M computer

by Bill Bolton

IT SEEMS things are shaping up for an intense amount of 16-bit system activity in early 1982. Both Godbout and Cromemco will introduce 68000 CPU cards for IEEE-696/S-100 bus systems.

Empirical Research already has such a card available.

The Cromemco card will have a Z80 and 68000 with switching between processors under software control. Cromemco expects to make most of its existing software available for the 68000, including CROMIX. (Speaking of CROMIX, I hear factory support is somewhat lacking).

Cromemco will also introduce 16-bit wide memory, with parity-bit checking on card.

Godbout has three new 16-bit cards in the works. As well as the 68000 card there is an 8086 card and another secret reportedly unique 16 bit CPU product.

NorthStar ADS

Anything that mentions the C programming language immediately grabs my attention. NorthStar has a new product coming called the Applications Development System. This will allow programmers to develop custom business software using C.

The package includes an editor, compiler, 8080/Z80 assembler and an extensive library of utilities and functions in source code. Reported quite expensive, but if the C implementation is good, it could well be worth it.

Wordstar Version 3

As some of you know, this column is written using WordStar, and supplied to the editor as a text file on disk. I recently upgraded, and both this column and the previous one were written using WordStar 3. In addition to the well-publicised column move and horizontal scrolling, there have been some other changes in the package.

The manual is even better organised, with clear internal divisions and some useful new tables.

The cursor handling routines seem more robust and cover a wider range of terminals. The on-screen menus have been completely reorganised, which at first is a bit off-putting, but is much better once you get used to it.

For all of you who try to use WordStar as a text editor for programs, there is a new patch point which will make WordStar default to the N (non-document) mode when file names are given on the CP/M command line. I haven't had a chance to look at SpellStar yet, but should be able to comment next month.



IEEE-696 Standard

The IEEE 696 standard was submitted to the IEEE standards committee in September. Some minor changes were made to it as previously published; several minor errors were corrected, and revisions were made to the sections on multi-master operation, extended addressing and operation of the PHANTOM line.

An entirely new section (Section 5) has been added to the standard titled 'levels of compliance'. This new section will enable suppliers and users to accurately specify how closely a product complies to the standard.

The new section is too long to reproduce here, but a typical compliance statement might look like this:

696 Bus Compliance: Slave D8/16 M24
I16 T150

which would indicate bus Slave, 8 or 16-bit data path, 24-bit memory address path, 8 or 16 I/O address path, worst case access time of 150 nanoseconds.

Osborne Business Software

Seemingly, one of the best software buys around is the Osborne CBASIC business package. For the price of three books (around \$70) you get the complete CBASIC source code for a general ledger, receivable/payable and payroll. It is set up for US use, but with the source code, that isn't such a big problem.

There is only one catch: the programs really don't work very well. This isn't due to any major faults in the algorithms, but rather due to minor faults in trivial pieces of code.

The cursor position drivers are absolutely awful, for instance. I struggled with the package for a while, as have many other programmers, and then regrettably gave up.

Fortunately, some people are more persistent. A US company called Vandata kept at the Osborne programs, and has extensively rewritten the troublesome portions of code, while staying within the original Osborne specification.

The Vandata programs work very well, and are supplied in full CBASIC source code, so you can still modify them to suit yourself. As Vandata is still within Osborne specification, the Osborne books are still the major documentation. The brief, but excellent, Vandata document only covers the changes.

I don't know if any local dealers are handling Vandata yet, but it is certainly worthwhile asking.

Pricing is around \$300 per package. Vandata has recently announced an inventory program which integrates with the other Osborne programs, though I haven't seen it yet.

A Patch for DDT

Here is something for the software hackers. One of the less endearing features of DDT is it enables interrupts (EI instruction) before running a trace on a program.

Many users would probably never be aware of this as most CP/M BIOSs do not use interrupts. However, if you do have an interrupt driven BIOS, or are using MP/M, you will quickly notice the strange behaviour of DDT.

Here is an interactive command sequence using DDT 2.0 to patch DDT 2.0, to disable the EI instructions by replacing them with NOP.

The bold type is the user input.

```
A>DDT DDT.COM
DDT VERS 2.0
NEXT PC
1400 0100
-SABO
OAB0 FB 00
OAB1 C9 .
-S1022
1022 FB 00
1023 2A .
-GO
```

A>SAVE 19 DDTX.COM

The reason for disabling DDT's EI instructions is the program being executed should have full control over when interrupts are enabled or disabled.

CP/M Compatible?

There are a number of operating systems which are supposed to be CP/M

Continued on page 92

GLOBAL SOFTWARE NETWORK

SORCERER SOFTWARE

UTILITIES:

GRAPHICS 1

Resolution of 128x90. Fantastic demonstration includes screen motion, X-Y-Z plotting, bar charts, circles and stars. Figures can occupy the entire screen if desired. \$25.95.

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\$25.95.

Both Graphics 1 and 2 include point and line drawing features in machine code.

SUPER DISASSEMBLER

This is a very fast two pass disassembler written in machine code. It produces a Z-80 assembly language source file with labels that is directly compatible with the Sorcerer Development Pac.

The disassembler has a Displacement function which allows any program residing anywhere in memory to be decoded, whether it is at its normal address or it has been moved to be decoded.

The output can be set to video, printer or cassette. The cassette file can be read into The Editor or Assembler of the Development Pac.

Several versions on tape at different memory locations. (N.B. Development Pac not necessary). \$21.95.

EZYFILE

A general purpose database system for handling alphanumeric data. Written in Z-80 machine language and useful for catalogue/filing data, mailing lists, music libraries, club membership etc. etc. Files may be stored on disk under the CP/M 1.4 or later operating systems. Commands available: Create, Load, Merge, Save, Add, Delete, Edit, Sort, List, Report, Total, Printer, and more. Cassette \$35.95. Vista, FDS etc. floppies \$39.95.

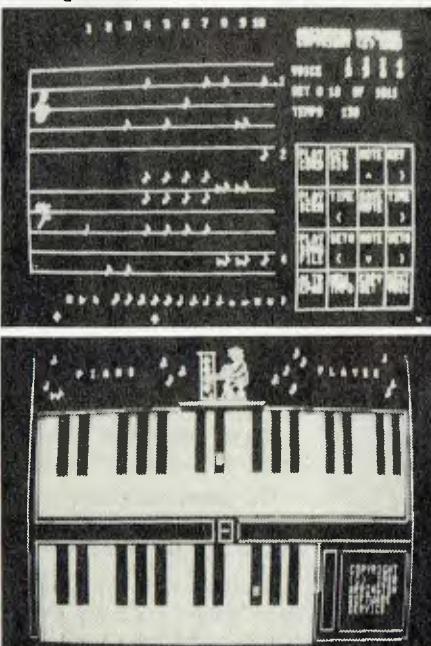
4 VOICE MUSIC SYSTEM

The software enables you to easily write music as it displays both the treble and bass staves on which one moves the cursor up and down to place the desired notes for

each four-part chord. Features include:

- hearing • hearing a note before it is selected
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SORCERY BREWS

Is a manual of programming tricks specific to the Sorcerer. This ready reference of valuable examples simplifies programming efforts and improves both professional appearance and performance.

The manual has chapters on Keyboard, video, joysticks, machine language, specific functions, CP/M, and Basic ROMPAK Map.

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YC. 6

These programmes and more available from:

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DEALERS ENQUIRIES WELCOME

your **APPLE** computer

THIS MONTH'S issue has been handed over to reader contributions with articles provided by Mark Brindle and Steven Zanker. But first a postscript to last October's ZARDAX review in *Your Computer*.

ZARDAX is an improved version of the Computer Solutions word processor. For some time there has been a wide-spread misunderstanding about the capability of the original word processor to supply printer control commands that are preceded by an ESCape code, as with the Epson range of printers. This week, I received some information from Ian Phillips, the author of ZARDAX, via The Source, where he explains the printer control commands in better detail.

Greg,

I enclose some information that may be of interest to the readers of *Your Computer*. There are two subjects covered here. First is a denial of the damaging criticism in Matt Whelan's review, which suggested that our WP was incapable of sending ESC codes to the printer. The second topic is the new version of our software.

• It was suggested in Matt's review that the WP could not send control codes to the printer. In fact, it is quite easy and was mentioned on page 10 of the manual. It requires the entry of a special prefix, CTRL-* followed by a single character. CTRL-* followed by A will produce a control-A CTRL-* followed by B will produce a control-B, and so on. Similarly CTRL-* followed by a [will produce a control-[(which is ESCape). In this way, any code may be sent to the printer.

• A much expanded version of our software has now been published under the name ZARDAX. The software retains the extraordinary human engineering of the previous product. However, it is now possible to implement special printer features as commands within the word processor. This means that the typist no longer needs to learn anything about escape codes, though it is still possible to output them as before.

ZARDAX includes many new features including doublewidth, doublespace, headers, footers, chapter-relative page numbering, boldface, red and black printing — all these and much more as well as being packaged as a word processing system which is elegant and simple.

Previous users of our software may update to the new version by sending their old manual and one of their two disks, with payment of \$40 to Computer Solutions, PO Box 397, Mount Gravatt, Qld. 4122. See your dealer for more information.

We are not positively encouraging users to update. Many users may be quite satisfied with the system they have, and may not wish to update. If in doubt, the user can call in to any Apple dealer or contact Computer Solutions directly.

Ian Phillips

And so FORTH

The choice of word processor used by any individual is a very subjective thing, with many word processors offering similar capacity at a similar cost. It is up to the individual to enquire 'Test drive' and find the word processor that is most suitable. Among the advantages of being an Apple owner is the availability of other programming languages besides BASIC.

One of the least expensive alternatives to be implemented on the Apple is FORTH. My experience has shown that attitudes about FORTH are polarised into those who love it, and those who hate it. Very few who have tried it remain uncommitted. Mark Brindle has, over the last few months, been exploring the world of FORTH. Here's what he found:

FORTH was originally developed in the late 1960s by C.H. Moore and E.H. Rutherford for minicomputer control of large telescopes. It is a stack oriented language using RPN (Reverse Polish Notation) logic. For example: using RPN, "4-3" becomes "4 3 -". Those who have used a Hewlett Packard or Texas Instrument calculator will be acquainted with the procedure.

Programs are written by defining verbs, which are sequences of one-fifteen characters, terminated by a space or (CR). A verb tells FORTH to perform a predefined function which is very similar to a BASIC GOSUB statement.

The 'Dictionary' is a list of predefined verbs which contain your programs. Programs are designed in a pyramid fashion by defining new verbs from verbs already defined. Finally, one verb will define the whole program.

Supplied with the FORTH language, the dictionary contains approximately 180 defined verbs. Whenever a verb is defined, it is automatically added to the dictionary. Verbs can be dropped from the dictionary by using the verb FORGET.

Note: Some verb names may differ from version to version. The version referred to here is Softape FORTH 11. Version 3.2.

Some of FORTH's strong points are:

- Its speed — approximately 15-20 times greater than BASIC.
- Each verb can be tested individually for very quick and simple debugging.

- No GOTO statements — therefore bad nesting of code is impossible. It has no line numbers. (In fact FORTH verbs can be nested up to 100 levels deep.)
- Its ability to work in any base. This is accomplished by the verb BASE. DECIMAL and HEXadecimal have their own predefined verbs, which are DEC and HEX.

If you have ever needed to convert a decimal number to a hexadecimal while writing a program, you will appreciate this first example. Note that this is in the immediate mode. Convert 124 (DECimal) to HEXadecimal.

DEC 124 HEX. . DEC (CR)
#7C

Here's how it works:

- DEC sets the base to 10
- 124 is pushed on top of the stack
- HEX sets the base to 16
- . prints the number on top of the stack, in the current base
- DEC resets the base to 10

At this point, I shall describe some of the predefined verbs in the dictionary.

:	BEGIN COMPIILATION OF VERB
;	END COMPIILATION OF VERB
.	PRINT VALUE ON TOP OF THE STACK IN THE CURRENT BASE
S.	PRINT THE CHARACTER STRING WHOSE ADDRESS AND LENGTH ARE ON THE STACK
SPACES	PRINT NO OF SPACES
DO	BEGIN DO-LOOP
LOOP	END DO-LOOP
I	CURRENT INDEX OF DO-LOOP
DROP	DROP TOP NUMBER FROM STACK
PAGE	CLEAR SCREEN AND HOME CURSOR
CR	PRINT A CARRIAGE RETURN
!	STORE A VALUE, AT A GIVEN ADDRESS
@	GET THE VALUE FROM THE GIVEN ADDRESS
+	SIGNED ADDITION
-	SIGNED SUBTRACTION
*	SIGNED MULTIPLY
/	SIGNED DIVISION

Using some of these verbs, let's write a program which will convert DECimal numbers to HEXadecimal numbers.

: DECHEX start compilation of a new verb, named DECHEX
HEX . set base to 16 and print top of base
DEC ; reset base to 10 and end compilation of verb

your APPLE computer

This program could have been done in one line

```
: DECHEX HEX . DEC ;
```

The verb DECHEX is now in the dictionary. To convert 124 to HEXadecimal, type:

```
123 DECHEX (CR)
```

```
#7C
```

Note the space between 123 and DECHEX. If there is no space, FORTH assumes that 123DECHEX is a verb, and would print 123DECHEX-UNDEFINED.

FORTH contains several looping devices. The first is the BEGIN-END loop. The verb BEGIN marks the beginning of the code to be looped. The verb END marks the end of the code and controls the loop. When the END verb is encountered, it checks the top of the stack. If it finds a zero, then the loop starts again. If it finds a non-zero, the loop is exited. By using this method, an infinite loop can be achieved by pushing a 0 on the stack, before the verb END.

e.g. BEGIN 0 END

The second is the DO-LOOP. This loop is the same as the FOR-NEXT loop in BASIC. The verb DO marks the beginning of the loop. The verb LOOP defines the end of the loop. When the verb LOOP is encountered, the index (I) of the loop is increased by 1, and is compared against the limiting value. If they are equal, then the loop is exited. If they are not equal then the loop starts again at the verb DO. Note that the limit value = number of loops required + the increment value.

Character strings are also easy to use. Say we want to print YOUR COMPUTER. In BASIC, this would be done by a PRINT statement:

```
10 PRINT "YOUR COMPUTER"
```

In FORTH this would be done in the following way:

```
" YOUR COMPUTER" S.
```

Note the space between the first " and YOUR. This tells FORTH that this is a character string. If the space is omitted, then FORTH assumes that "YOUR is a verb. The space is omitted when the string is printed.

When a character string is called, FORTH places the length of the string on the stack, followed by its address.

Let's write another program using a DO-LOOP and have it print the index of

the loop each time through. For comparison, a BASIC program is also shown which does the same thing:

```
:SUSAN (BEGIN COMPILE OF  
VERB SUSAN)  
DEC (SET BASE TO 10)  
17 0 DO (BEGIN DO-LOOP. 17 IS THE  
LIMIT AND 0 IS THE  
INITIAL INDEX)  
" I=" S. (PRINT I=)  
I . (TAKE CURRENT INDEX AND  
PRINT IT)  
CRT (PRINT A CARRIAGE RETURN)  
DROP DROP (1ST DROP I, 2ND DROP  
ADDRESS OF STRING)  
DROP LOOP ; (DROP LENGTH OF STRING.  
END OF DO-LOOP. END VERB  
COMPILE)
```

Here is the BASIC program.

```
10 FOR I= 0 TO 16  
20 PRINT "I=";I  
30 IF I = 16 THEN END  
40 NEXT I  
50 GOTO 20
```

FORTH contains a predefined verb name CONSTANT. The verb CONSTANT is used as the name suggests, for defining constants. For example, to define a verb BILL with a constant of -3.

```
-3 CONSTANT BILL (CR)
```

Now, any time the verb BILL is called for, -3 will be placed on top of the stack. Another is the Variable Verb. This verb is used for defining variables. For example, to define a variable named JO, with an initial value of 90.

```
90 VARIABLE JO
```

Variables are accessed in a different way to constants. Any time the verb JO is called, then the address of JO is placed on the stack. We then use the verb, which will replace the address with the value of JO.

```
JO @ (CR)
```

To place a new value in JO we use the verb ! For example, to place -16 in the variable JO

```
-16 JO !
```

JO now contains -16.

FORTH contains several comparison verbs. One such verb is =. The = verb is a logical operator. Logical operators return a true or false indicator (flag). If the test is true, 1 will be placed on the stack. A false

test will place a 0 on the stack. For example:

```
E.6 3 3 = . (CR)
```

```
#1
```

```
Where 59 6 = . (CR)
```

```
#0
```

Other comparison verbs are:

```
< = > < > 0= <>
```

These verbs are used in conditional test statements. The first of these is the IF-THEN statement. The verb IF removes the result of the comparison test. If its condition was true (1 on the stack), then the code between the verbs, IF and THEN will be executed. If it finds a 0 (false) then execution continues after the THEN verb, e.g.:

```
: HERBERT (Start compilation of a  
verb named HERBERT.)
```

3 3 = (Test to see if 3 and 3 are equal.
if yes then place a 1 on the stack. If false
place a 0 on the stack)

```
IF "TRUE" S. (If test is true then print  
TRUE)
```

```
THEN "DONE" S. ; (If test is true then  
print FALSE. End compilation of verb  
HERBERT.)
```

To run program type HERBERT (CR)

```
#TRUE
```

Sometimes it is necessary to have a conditional test, where, if false, do one piece of code and if true, do another. This can be accomplished by the IF-ELSE-THEN statement.

If the IF verb finds a one (true) execution continues after the IF verb. If it finds a zero (false), execution continues after the verb ELSE. The program continues after the verb THEN. For example:

```
: DIG 4 2 = IF " TRUE" S. ELSE  
" FALSE" S. THEN " DONE" S. ;
```

```
Type DIG (CR)
```

```
#FALSE DONE
```

Supplied with the FORTH language is an applications program called the Editor. Program development takes place in the buffer using the editor. Although FORTH needs no line numbers, the verb ADD

continued on page 96

THE AUSTRALIAN SOURCE

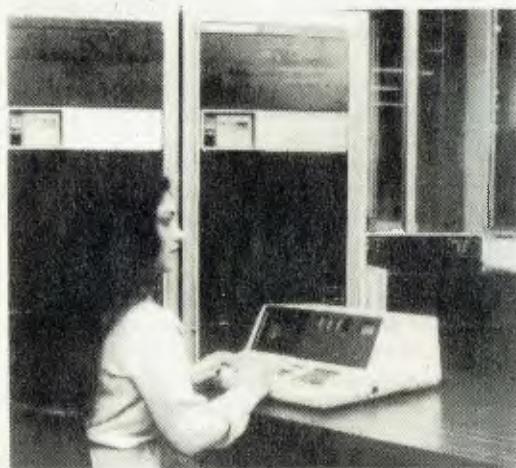
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your PET computer



LAST ISSUE I spoke briefly about a single disk drive system for the PET that I had seen in the US, called PEDISK II. Since then, I have discovered they are available in Australia.

With the PEDISK II system, a small controller board is mounted inside your PET or CBM. This controller contains the P DOS software ROM and the disk control circuitry. The effect on the memory capacity of the PET is small, with a loss of 2K bytes. This means that those with a 16K machine will not suffer much loss of computing power.

The unit itself is attractively packaged in a sort of off-white colour and stands comfortably beside the PET. It takes the disks vertically and it is extremely easy to operate.

PEDISK II comes in six configurations:

- Model #540 (single or dual) 143K per drive, 40 track 28 Sector 5inch
- Model #580 (single or dual) 286K per drive, 40 track 28 Sector 5inch

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These are suitable for CBM 8032, CBM 4000, CBM 3000, and PET. Prices are not yet final, but the #540 single will be around \$700.

- I — read program into memory
- M — memory examine/change monitor
- P — print directory of files
- R — return to basic
- S — save program to disk
- X — execute program after loading.
- U — utility includes capability to format, copy, compress and patch.

The PEDISK unit is based on the TEAC drive and is extremely fast with a transfer rate of a quarter of a megabyte of information per second. The 8inch drives use the standard IBM 3740 format which allows for data interchange with large computers. This means that mail lists and data files available on large mainframes can be processed by the PEDISK system.

On the home front, it means that at last the hobbyist can now have access to a disk system at a price which will not break the bank.

It is interesting to note that Commodore has now started to advertise on The

Source that a single disk drive is soon to be released in the US. I wonder whether the PEDISK has given Commodore the technological knowhow to actually put together the single drive which has been promised for two years.

The PEDISK should be available from most Commodore dealers, as importers have indicated they want dealers to participate.

I feel the PEDISK is very good value for money — in fact on per byte of information storage, it comes out very favourably against the 4040 drive. But I feel that the availability of a disk unit for around \$700, when previously the only disks cost \$2000, is in itself the most important factor.

In the future, I hope to include in this column helpful hints on how to get the most from your PEDISK unit. □

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Join the National Sinclair ZX Users Group. Send a 24c stamp for an introductory newsletter to PO Box 148, Glen Waverley, 3150.

IBM Golfball Typewriter with interface into SORCERER computer \$1200. Development PAC for SORCERER computer \$110. Ring (02)633 4915 a.h.

ZX80, ZX81, MicroAce - The Australian ZX80/81 Users' Association has published many programs and much helpful information for owners of the ZX80, ZX81 and MicroAce computers. Membership only \$10. a year. For an Introductory Newsletter send a 30 cent stamp to: AZUA, 19 Godfrey Street, CAMPBELL, ACT 2601.

ZX80 with 4K and 8K ROM, assorted programs, ZX80 and '81 Manuals and special modifications. Almost new, \$260. Phone (03) 2326410.

SARGON II - Chess program, Commodore (2000, 3000 + 4000). Works even in 8K and old and new ROMS. Send \$100 cheque, state your model. To:

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Knickstr. 10
3256 Coppenbrugge 6
W-Germany

SYSTEM 80, monitor Level 2 16K Price \$650.00. Phone 9691527. After 4.00 pm.

Sell, ZX80. 8K ROM, 16K RAM. Pwr Sup, Manual, Programs \$350. SYM-1 Manuals. Never used \$140. Phone Mike (062)41 5140.

Hewlett-Packard 9871A Printer, 11336A Interface, little used, just serviced, with ribbons, 10 daisy wheels: \$2100. o.n.o. Ph. (02)456 1322.

Sale or Hire, Zilog 1/05, 2 diskette drives, screen and Dec Printer. Unused and in as new condition. Phone (02)913 8638.

For sale - Centronics 779 Printer, has had very little use, must be sold. \$500 o.n.o. Ph. Garry Nelson (042)71 4054.

ZX80, Mains Adapter, Invaders and Double Breakout Cassette plus '30 program for the ZX80' book. \$200. Contact B. Stringer, Portland (055)23 2924.

Sinclair ZX80, complete with 8K ROM + 16K RAM. Perfect condition - see operating. Cost over \$500 - Sell \$300. Phone (Melb) (03)359 6311 A.H. Mark Kerr.

SELL - ZX80 - 8K ROM, 16K RAM, Manuals, Programs, etc. As new \$420 o.n.o. Phone (085)412344 or Write Lutheran School, WAIKERIE 5330 - R. Kube.

SELL - TRS-80 48K, 1 disk, ITOH 8300P printer, Hires graphics, lower case, over \$1500. software. \$3750. Phone Bob (02) 6014590 AH.

NOW AVAILABLE: For those who missed out, we have obtained limited stocks of *Your Computer* issue numbers 1, 2 and 3. Available from White House Publishing, 706 Military Road, Spit Junction for \$2 per copy or write to White House Publishing Group, PO Box 216, Spit Junction, NSW., 2088 for mailed copies at \$2.50 per copy.

Your CP/M computer

Continued from page 84

compatible. The major ones found in Australia are CDOS, from Cromemco, and SDOS, from SDS. Actually, SDOS is an emulation of CDOS, so I'll just consider CDOS.

CDOS is only CP/M compatible with CP/M version 1.33, long out of date.

Since then, CDOS and CP/M have pursued different development paths. Any programs written to use the enhance-

ments in CP/M 2 will probably not work under CDOS. Similarly, most Cromemco programs won't run under CP/M, particularly the more recent ones. For most users this is not a serious problem, but you should be aware of it.

Recently there have been some new entries into the CP/M look-alike field, notably TurboDOS. This product is supposed to be CP/M 2 compatible. The general reason for doing a CP/M emulation is to provide some sort of extended features not supported by CP/M.

There is one general comment to make about CP/M look-a-likes; at any time DR could decide to make any sort of enhancements to CP/M. They are only morally obliged to maintain compatibility with their own previous products, and so could easily choose to introduce new features which conflict with the extended features of the look-a-like.

There are many, many more CP/M systems in use than any of its imitators. Commercial programs are developed for CP/M environments, not for CDOS, SDOS, or

your computer club news

TRS-80 USERS might be interested in two users group developments planned for Sydney.

Two Sydney TRS-80 Model 1 Computer owners have installed Mappers 1 and 2, supplied by Omikron of California, and are now operating normal CP/M with 8-inch drives. One configuration addresses the double sided drives as only two drives, while the other addresses them as four drives.

They propose to form a project-oriented study and mutual assistance group in Sydney.

Contemplated projects include double density operations; operating with more than 4 drives; expanding RAM to 64K; evaluating software; and modifying non-CP/M utilities to operate under CP/M.

Mapper owners interested in forming part of this group are invited to write to Dan Lawrence, GPO Box 2551, Sydney 2001.

* * *

TRS-80 OWNERS living in the Eastern Suburbs and near city areas of Sydney are invited to form a users group. Emphasis will be on disk-based systems, although non-disk users should also inquire as they can be organised into a subgroup.

Send a stamped addressed envelope, with hardware configuration details, to Dan Lawrence, TRS-80 Eastern Suburbs Group, GPO Box 2551, Sydney, 2001.

AUSTRALIAN CAPITAL TERRITORY

Australian ZX80 Users' Group (AZUG); David Brudenall, 19 Godfrey St, Campbell, ACT 2601.

MICSIG; Registrar, PO Box 446, Canberra 2601

OMEGA (Ohio Scientific Microcomputer Enthusiasts Group Australia); Geoff Cohen, 72 Spofforth St. Holt, ACT 2165.

Sorcerer Computer Users of Australia (ACT Branch); Mr G.T. Dick, 31 Creswell St, Campbell, ACT 2601.

TurboDOS environments.

My feeling is you'd have needed one of the extended features of a CP/M look-alike DOS very badly to step away from a straight CP/M environment — considering the risks of future software incompatibility.

Versafloppy

By now all the SDS Versafloppy 2 users are saying to themselves: "All very well, but where can I get a properly implemented CP/M 2.2 for my disk controller".

NEW SOUTH WALES

Australasian ZX 80 Users Newsletter; 87 Murphys Avenue, Keiraville, NSW 2500
Commodore Users Group; John Guidice, GPO Box 4721, Sydney 2001.

Compucolor Users Group; Andrew MacIntosh, 91 Regent St. Chippendale, Sydney 2008.

80-AT; The Australian 8080-Z80 Users Group; PO Box 165, Lakemba 2195.

Macarthur Computer Users Association; R.G. Friend, C/- 109 Campbellfield Ave, Campbelltown, 2560. Phone (046) 25 2752 (A.H.) or (046) 76 0541 extn 325 (Work).

MEGS; (Microcomputer Enthusiasts Group); John Whitlock, PO Box 3, St. Leonards 2065.

Newcastle Microcomputer Club; Gordon Johnson, Electron Microscope Unit, University of Newcastle. Phone (049) 68 5045 (Work).

NSW Apple Users Group; John Smith, 1a Wallaroy Road, Double Bay 2028, Phone (02) 36 5696.

NSW 6800 User Group; 27 Georgina Avenue, Keiraville, NSW 2500.

Sorcerers Users Group; PO Box E162, St. James 2001. Ian King, 15 Forest Avenue, Wahroonga 2076. Phone (02) 48 6072.

TI-99/4 Home Computer Users' Group of Sydney; S. Andersen, PO Box 101, Kings Cross, 2011. Phone (02) 358 6662.

NORTHERN TERRITORY

The MicroComputer Association of the Northern Territory; Andy Smith, Darwin Community College, Casuarina, NT.

QUEENSLAND

Brisbane Youth Computer Group; A. Harrison, PO Box 396, Sunnybank 4109.

Commodore Computer Users Group of Queensland; Mrs D.D. Dillon, PO Box 127, Stones Corner, 4120.

Iree Microcomputer Interest Group; N. Wilson, PO Box 811, Albion 4010.

Superboard Users Group, Ed Richardson, 146 York Street, Nundah, 4012.

SOUTH AUSTRALIA

Adelaide Micro User Group (TRS-80 and System 80 Users); R.G. Stevenson, 36 Sturt St, Adelaide 5000.

Unfortunately, most of the CP/M 2.2 implementations for the Versafloppy 2 fail to make use of its full potential, particularly in respect of double-sided drives.

There is one implementation used by some of the universities that does it properly, but it isn't readily available, and it requires a good knowledge of assembly language to implement.

But don't be too disheartened, even in the US Versafloppy 2 users complain about the lack of a good CP/M 2 for their controllers.

South Australian Microprocessor Group Inc (SAMG); The Secretary, PO Box 113, Plymton, 5038. Phone (08) 278 7288.

TASMANIA

TAS-Micro; Peter Deckert, Unit 1/456 West Tamar Rd, Riverside, Launceston, 7250.

Tasmanian OSI Users Group; David Tasker, 11 Bass Highway, Westbury, 7303.

VICTORIA

Apple Users Society of Melbourne; G. Halprin, Phone (03) 859 5835.

BUG 80; Burwood Users Group, PO Box 46, Blackburn South 3130.

Compucolor Users Group; L. Ferguson, 12 Morphett Avenue, Ascot, Melbourne 3342.

Geelong Computer Club; Peter McKeon, PO Box 93, Geelong 3220.

KAOS (Ohio Scientific); David Anear, 49 Millewa Crescent, Dallas, 3047.

National ZX80 Users Club; 24 Peel St. Collingwood, 3066

Northern and Western Suburbs Computer Users' Group; contact CP/M Data Systems, 284 Union Rd, Moonee Ponds, 3039. Phone John King (Secretary) (03) 338 9304

SMUG; SCORD M100 users, Robin Miller, 60 Wimalee Drive, Glen Waverley 3150.

Sorcerer Computer Users (Australia); Secretary, PO Box 144, Doncaster 3108.

WESTERN AUSTRALIA

Sorcerer Computer Users of Australia; The Secretary, 90 King St, South Perth 6151. Phone (09) 367 6351.

CU WEST (WA Compucolour/Intecolor User Group); John Newman, 8 Hillcrest Drive, Darlington, 6070.

NEW ZEALAND

Wellington Microcomputer Society Inc; Lindsay Williams, 2 Pope Street, Plimmerton, New Zealand.

Perhaps some reader has solved this problem. Please let me know and make a lot of Versafloppy 2 users happy.

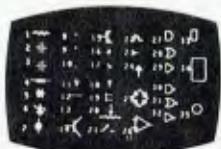
Feedback

Send your questions about CP/M to Bill Bolton, CP/M Column, *Your Computer*, PO Box 216, Spit Junction, Mosman 2088. No guarantees that your question will get answered in the column, but I will try. Source users can contact me at TCY396 (I don't read Source mail unless there is a clear subject heading). □

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your OSI computer

WELCOME to our new Ohio Scientific column, where I will try to keep you OSiers up to date on all the new hardware and software for OSI.

First, I am pleased to report TCG (the Australian agent) has seen the light, reducing the price of Superboards (from \$475 to \$319), and C1 computers (from \$750 to \$499). TCG is selling these directly (or mail order), and will hopefully reduce the cost of its other models soon.

I imagine the influx of cheap computers such as the System 80 and VIC may have prompted this. But after all, competition is what it's all about.

Until now, OSI has received relatively little publicity in most of the microcomputing journals. (Thanks again O' worthy editor.) So I was most interested in the results of a survey in the American 6502 magazine, Micro.

This gave the following figures for the top five computers used by their readers (most people had more than one CPU, hence the figures add up to more than 100 percent): Apple 50 percent; OSI 39 percent; KIM 15 percent; AIM 13 percent; PET 13 percent.

This seems to point to a catch-22 situation, where few editors publish OSI articles, because there is no perceived reader base, and not many OSI users send in articles as they assume they will not be published.

It seems there are enough users out there, so how about sending in all that great OSI software to our editor, or one of the user groups listed in the magazine.

The factory and the dealers here in Australia haven't helped either, as they don't advertise to anything like the extent of Apple or Tandy. They also seem unwilling to use the not inconsiderable resources of the many user groups and independent manufacturers to increase both the sales of the computers, and the user feedback to increase product performance.

OSI was even reported to have considered legal action against manufacturers second sourcing its 48-line bus products. But thankfully, this is now a thing of the past.

Now the Bouquets

CHANGING from brickbats to bouquets, I will list what I consider to be the advantages of an Ohio Scientific system.

First, the hardware is very well designed and constructed, with an extremely low failure rate. There are a few design constraints, such as only 64 characters on the VDU, and the strange disk storage system, which only gets 80K

instead of 102K on a mini-floppy. This is caused by having a start, stop and parity bit for each data byte. But I am designing a new disk controller, which should fix this problem, giving an IBM compatible disk format.

The OSI 48-line bus is a well proven design, and unlike some other bus systems, has provision for a 12-bit data bus and a 20-bit address bus. The interfacing signals for the 6502 are so simple there is no problem connecting 6800 or 6809 boards (except maybe physically). Until recently I was using Motorola 6800 memory boards on my home CPU.

Starting from the simplest cassette based Superboard or C1, these computers are easily upgraded to a larger VDU, with floppies. On my system, I designed and built a 64 x 32 VDU PCB, a minifloppy disk controller and a 24K RAM board (2114s). These are available through Omega, and there are many of these ex-C1 computers now running as C4 computers.

New Products

ONE OF the new products from Ohio is a high resolution graphics board for the C4, with 256 x 512 individual point addressable graphics — eat your heart out Apple. The board has 16K of RAM for display, and an extra 8K for normal RAM. All the 24K of RAM can be used when Hi-res graphics are not required.

This is the 541 board, and is currently only available as a factory upgrade. But I hope we can persuade the factory to change this policy, and sell either the assembled board or the bare PCB for us hardware hackers.

OSI is also producing some new computers, the C5 range, which feature such goodies as: 6502, Z80, Z800 and 68000 processors; one megabyte memory; 25 x 80 and 25 x 132 and hi-res graphics; double sided, double density 80 track 13cm of disk-drives; 13cm Winchester drives (5 Mbyte); Pascal, CP/M, FORTRAN, COBOL, LISP AND BASIC.

There is no firm delivery date or price on these yet, but the C5 certainly seems to correct most of the deficiencies I mentioned above.

Although the factory provides a useful range of products, there are quite a few alternative sources of supply now. In the USA, D&N manufactures a range of memory boards, disk controllers and prototyping boards, while Mittendorf Engineering has a hi-res graphics board, with 256 x 256 resolution.

Home Grown

HERE IN Australia, Compsoft (225 Swan St, Melbourne, phone (03) 428 5269) sells quite a range of home grown OSI compatible hardware and software.

For the hardware types, the shop sells the Tasker bus boards. These are a range of expansion boards for the Superboard/C1, comprising a small backplane (only about 12 x 20cm) and a set of memory, disk controller, I/O and Prom burner boards.

These are only available as bare printed circuit boards, but they are very cheap. The designer of these is also the editor of the Tasmanian newsletter (TUG), which proves the worth of user group/OSI interaction.

I don't think the Australian agents even know about these boards, they have certainly never done a great deal to promote them.

George, at Compsoft, has also written a patch for OS65D. This has all (or most anyhow) of the features OSI should have provided, including DOS commands to delete and create file names, and also a directory function, which I find especially useful in word processing.

I believe a new version will soon be available (V4.2 ?), with even more functions. Compsoft also has a mini version of Pascal (Pascelf), which will run on either disk or cassette systems. Although I have not used this yet, it has received good reviews from people who have used it.

Closer to home, as mentioned above, I have produced some boards for OSI systems, which have mainly been used by readers of the Omega newsletter.

The boards available are a conversion from C1 to C4 display (with colour and sound), a disk controller, a disk motor controller, an audible logic probe with pulse stretching (200ns) and LEDs, a battery back-up real time calendar clock, a 6502 single cycler and LED display of data and address that is a simple logic analyser), a 48-line bus eight-slot backplane, a Prom burner (2508, 2716, 2732), and a parallel printer interface, for C1 or C4.

IN THIS first column I have tried to provide as detailed a description as space permitted of the hardware and software available for OSI systems in Australia. In future columns I will provide some useful software and general hints, and also keep up with new developments here and in Ohio.

If any reader wants to congratulate or complain, I can be contacted via this magazine.

—Geoff Cohen

your APPLE computer

continued from page 88

(used when the editor is present), issues line numbers to the end of the text buffer, to facilitate program development. For example:

L 1 6 (CR) Will list lines 1-6

This line numbering system also allows for editing, deleting and inserting, line by line. Another verb is LOAD. This will compile the text in the buffer. Once it is compiled it is then added to the dictionary. Using the editor, lets write a program that will create a hexadecimal, decimal table from 0-15(decimal).

```

ADD
1 : JOERG
2 4 SPACES      (PRINT 4 SPACES)
3 " HEX" S.      (PRINT HEX)
4 15 SPACES     (PRINT 15 SPACES)
5 " DEC" S.      (PRINT DEC)
6 CR CR;        (PRINT 2 CARRIAGE
                  RETURNS. END COMPIRATION)
7 : RITA
8 DEC 16 0 00    (SET BASE TO 10.
                  SET UP DO-LOOP)
9 5 SPACES HEX   (PRINT 5 SPACES. SET
                  BASE 16)
10 I .           (PRINT INDEX OF LOOP)
11 17 SPACES     (PRINT 17 SPACES)
12 DEC I.         (SET BASE TO 10.
                  PRINT INDEX OF LOOP)
13 CR DROP DROP (PRINT A CARRIAGE RETURN
                  DROP I DROP 17)
14 DROP DROP     (DROP I. DROP 5)
15 LOOP ;
16 : TABLE
17 PAGE          (CALL PAGE. CLEAR
                  SCREEN AND HOME CURSOR)
18 JOERG          (CALL VERB JOERG,
                  AND RUN IT)
19 RITA :         (CALL RITA. AND RUN
                  IT. END VERB)
LOAD

```

The verb TABLE now contains the whole program. To run the program, type TABLE (CR)

HEX	DEC
0	0
1	1
2	2

```

3      3      10 REM ART-ENCORE
4      4      20 REM *****
5      5      30 REM * AUTHOR: S.ZANKER *
6      6      40 REM *****
8      8      50 HGR2 : HOME : VTAB 20
9      9      60 MX = 278:MY = 190:V = 2
A     10     70 AO = INT (MX / 3):X0 = AO
B     11     80 BO = INT (MY / 3):Y0 = BO
C     12     90 A1 = MX - INT (MX / 3):X1 = A1
D     13     100 B1 = MY - INT (MY / 3):Y1 = B1
E     14     110 A2 = MX - INT (MX / 2):X2 = A2
F     15     120 B2 = MY - INT (MY / 2):Y2 = B2
130 D0 = (279 + 191) / 7
140 D1 = (MX * 2 + MY) / 7
150 D2 = (MY * 2 + MX) / 7
160 A9 = V:B9 = V:X9 = V:Y9 = V
170 A8 = V:B8 = V:X8 = V:Y8 = V
180 A7 = V:B7 = V:X7 = V:Y7 = V
190 REM
200 AO = AO + A9: IF AO > MX OR AO < 0
                  THEN AO = AO - A9:A9 = - A9: GOTO 200
210 BO = BO + B9: IF BO > MY OR B0 < 0
                  THEN BO = BO - B9:B9 = - B9: GOTO 210
220 X0 = X0 - X9: IF X0 < 0 OR X0 > MX THEN
                  X0 = X0 + X9:X9 = - X9: GOTO 220
230 Y0 = Y0 - Y9: IF Y0 < 0 OR Y0 > MY THEN
                  Y0 = Y0 + Y9:Y9 = - Y9: GOTO 230
240 A1 = A1 + A8: IF A1 > MX OR A1 < 0
                  THEN A1 = A1 - A8:A8 = - A8: GOTO 240
250 B1 = B1 + B8: IF B1 > MY OR B1 < 0
                  THEN B1 = B1 - B8:B8 = - B8: GOTO 250
260 X1 = X1 - X8: IF X1 < 0 OR X1 > MX
                  THEN X1 = X1 + X8:X8 = - X8: GOTO 260
270 Y1 = Y1 - Y8: IF Y1 < 0 OR Y1 > MY
                  THEN Y1 = Y1 + Y8:Y8 = - Y8: GOTO 270
280 A2 = A2 + A7: IF A2 > MX OR A2 < 0
                  THEN A2 = A2 - A7:A7 = - A7: GOTO 280
290 B2 = B2 + B7: IF B2 > MY OR B2 < 0
                  THEN B2 = B2 - B7:B7 = - B7: GOTO 290
300 X2 = X2 - X7: IF X2 < 0 OR X2 > MX
                  THEN X2 = X2 + X7:X7 = - X7: GOTO 300
310 Y2 = Y2 - Y7: IF Y2 < 0 OR Y2 > MY
                  THEN Y2 = Y2 + Y7:Y7 = - Y7: GOTO 310
320 HCOLOR= (AO + B1) / 10
330 HPLOT AO,BO TO X0,Y0 TO
                  AO,Y0 TO AO,BO
340 HCOLOR= (2 * X1 + Y0) / D1
350 HPLOT A1,B1 TO X1,B1 TO X1,Y1 TO
                  A1,Y1 TO A1,B1
360 HCOLOR= (2 * Y2 + X2) / D2
370 HPLOT A2,B2 TO X2,B2 TO X2,Y2 TO
                  A2,Y2 TO A2,B2
380 GOTO 190

```

You will find FORTH a little strange at first. Once you get used to the idea of working in RPN, it will come very quickly.

As you build your programs, you will discover that verbs which were defined in previous programs will not need to be re-defined. Using this method, you can customize your FORTH dictionary to suit the application for which the programs are written.

Mark Brindle

Colour fax

I would like to thank Mark for his article. If you have any questions about programming or have worked out useful programming techniques, please send them to me at *Your Computer* so the information can be shared by all.

Steve Zanker has dropped in a couple of graphics routines that may be pleasing to those with colour facilities on their Apple.

```

10 HGR2
20 A = 0:B = 0:X = 279:Y = 190:MX
      = X:MY = Y:V = 2:DI = (X +
      Y) / 7

30 HC = (A + B) / DI: HCOLOR= HC:
      HPLOT A,B TO A,Y TO X,Y TO
      X,B TO A,B:A = A + V:B = B +
      V:X = X - V:Y = Y - V: IF A >
      MX THEN A = 0:X = MX

40 IF B > MY THEN B = 0:Y = MY
50 GOTO 30

60 REM      HIRES SYMMETRY
70 REM      *****
80 REM      * AUTHOR: S. ZANKER *
90 REM      *****

```

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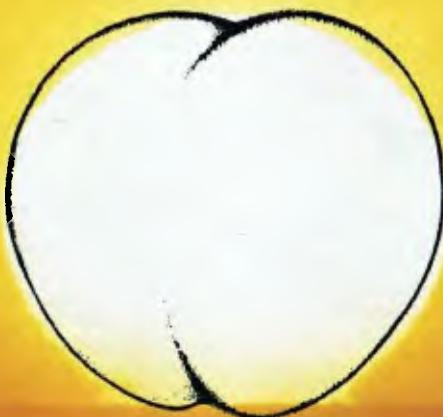
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